

THE HOME HANDY BOOK

A. FREDERICK COLLINS

THE HOME HANDY BOOK

By A. FREDERICK COLLINS

MAKING THINGS FOR FUN
THE AMATEUR MACHINIST
EXPERIMENTAL OPTICS
THE METALS
HOW TO UNDERSTAND CHEMISTRY
EXPERIMENTAL MECHANICS
EXPERIMENTAL CHEMISTRY
EXPERIMENTAL SCIENCE
BOYS' AND GIRLS' BOOK OF OUTDOOR GAMES
FUN WITH FIGURES
BOYS' AND GIRLS' BOOK OF INDOOR GAMES
THE BOOK OF PUZZLES
THE BOYS' BOOK OF AMUSEMENTS
THE AMATEUR ENTERTAINER
THE BOOK OF THE MICROSCOPE
THE BOOK OF WIRELESS TELEGRAPH AND TELEPHONE
THE BOOK OF STARS
THE BOOK OF MAGIC
THE BOOK OF ELECTRICITY
GAS, GASOLINE AND OIL ENGINES
THE AMATEUR CHEMIST
THE AMATEUR MECHANIC
AVIATION AND ALL ABOUT IT
THE HOME HANDY BOOK
KEEPING UP WITH YOUR MOTOR CAR
MOTOR CAR STARTING AND LIGHTING

THE HOME HANDY BOOK

A COMPENDIUM OF USEFUL THINGS TO DO
AROUND THE AVERAGE HOUSE AND
HOW TO KEEP IT IN REPAIR

BY

A. FREDERICK COLLINS

AUTHOR OF "THE BOOK OF WIRELESS," "THE BOOK OF STARS," "THE BOOK OF MAGIC," "THE BOOK OF ELECTRICITY," ETC.



FULLY ILLUSTRATED

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TO

JOSEPH GARFIELD BANDY

A WORD TO YOU

There are always a hundred and one things to do around the average house; and to keep it in repair and make it a nice, comfortable place to live in, it is strictly up to you to see that these things are done.

And if you don't do it you are missing a fine experience by not learning how to use tools, and, besides, you will have to send out every little while for the carpenter, the plumber, the locksmith and divers other journeymen to fix up things; or, failing to do this, the house will go to rack and ruin.

Now mechanics usually charge about seven prices for doing odd jobs, but it must be remembered that they not only figure up the actual time they put in and the materials they use, but they also count the time it takes for them to make the call and to get back to their shops again, and time with them is money.

On the other hand, to neglect the little repairs as they are needed means that the house will soon show signs of shiftlessness and this is an indecent burden that no self-respecting family needs to carry, for the reason that any one can do all the little odd jobs that ought to be done if he or she goes about it in the right way.

There are some other important gains that will accrue to you by using tools and doing the work yourself, and among them is that you can save the money which would have to be paid for outside help, and this is no incon-

siderable amount in a year's time; that your home will take on an aspect as spick and span as a lady's bandbox, which gives you a wonderful feeling of pride; and, finally, that it will set the red blood a-tingling in your arteries in virtue of the fact that your brain and hands are doing the finest kind of team work.

A. Frederick Collins.

"The Antlers,"
Congers, N. Y.

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CHAPTER I

TOOLS EVERYONE SHOULD HAVE

To do a job like a mechanic you must, first of all, use the kind of tools a mechanic uses, for good tools count for every whit as much as the skillful use of tools.

It is a truism that a poor workman will do just as good, or bad, a job with good tools as a good workman will do when handicapped with poor tools. Now the purpose of this book is to tell you not only what kind and make of tools to buy but how to use and what to do with them.

A large assortment of tools is not at all necessary but the important thing is that you should get the very best and as a sort of an index the price of each one is given so that you will know what good tools are likely to cost.

Wood Working Tools.—The following list of wood working tools comprise about all of those that my son and I have used in our house for the past ten years and they have served practically every purpose.

TOOL	COST
(a) Nail hammer	$.50
(b) Hand saw	1.75
(c) Back saw	1.20
(d) Miter box	.35
(e) Block plane	.90
(f) Adjustable smooth plane	1.25
(g) Two firmer chisels ¼ and ½ inch	.35 and .40
(h) Two firmer gouges ¼ and ½ inch	.25 and .35
(i) Brace and three bits, ¼, ⅜ and ½ inch	.75
(j) Two gimlets	.25
(k) Lathing hatchet or Boy Scout ax	.50
(l) Try square	.20
(m) Two-foot folding rule	.25
(n) Nail set	.10
(o) Washita oilstone	1.30
(p) Vise	1.50

(a) *Nail Hammer.*—This should be made of a fine grade of cast-steel. An adze eye, bell-faced hammer made by the Ohio Tool Company, weighing 1 pound and 3 ounces, will give satisfaction. It is shown at *a* in Fig. 1.

(b) *Hand Saw.*—A Disston or Atkins saw made of *silver-steel* and having a 20-inch blade will serve all ordinary needs. A *rip saw* for sawing boards the way the grain runs is useful but you can get along without it.

(c) *Back Saw.*—This saw should also be made of *silver-steel* and one with a 12-inch blade will be large enough. It is used with a *miter* box.

(d) *Miter Box.*—This is a box formed of a bottom and two sides and is usually made of beech or

other hard wood. Slots are sawed in the box at angles of 45 and 90 degrees. A good size is $2\frac{5}{8}$ inches high, $3\frac{3}{8}$ inches wide and 18 inches long.

(e) *Block Plane.*—Get a block plane with an ad-

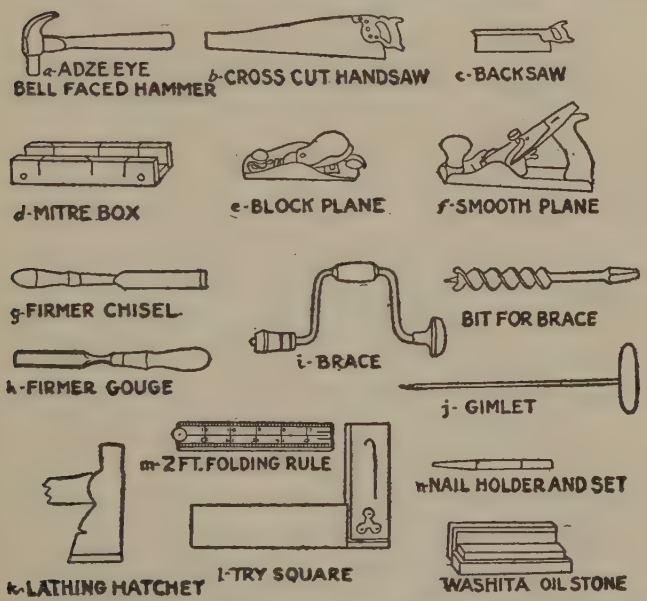


Fig. 1.—Wood working tools you should have.

justable opening and also see that it has a lateral adjustment for the cutter. A Stanley plane is a good one to buy and get one that has a $1\frac{3}{4}$-inch cutter and is 7 inches long.

(f) *Smooth Plane.*—This is made just like a steel jack plane only it is much shorter, being about 9 inches in length; it has a cutter $2\frac{1}{8}$ inches wide and

it weighs 3¼ pounds. It is especially adapted for planing soft woods.

(g) *Firmer Chisels.*—These are ordinary flat chisels and they can be had in all widths from ⅛ inch up to 2 inches. A couple of chisels will be enough to start with and these should be ¼ inch and ½ inch in width respectively. These chisels are usually ground sharp and are honed ready for use when bought. The Ohio Tool Company makes good chisels and gouges.

(h) *Firmer Gouges.*—These gouges should be beveled outside and get them with ¼ and ½ inch blades. Like the chisels they are ground sharp and honed before they leave the factory.

(i) *Brace and Bits.*—A plain brace and three bits, ¼, ⅜ and ½ inch in diameter, will be found the most useful. Other sizes can be added as they are needed.

(j) *Gimlets.*—A large and a small gimlet will come in handy to start screws, etc.

(k) *Lathing Hatchet or Boy Scout Ax.*—A lathing hatchet with a 2½-inch blade is a handy tool to have around but I like a Boy Scout's ax better. You can take your choice.

(l) *Try Square.*—Get a try square with a handle having a brass face plate and a blade 7½ inches long.

(m) *Two-Foot Rule.*—A regular carpenter's boxwood two-foot, four-fold rule divided into 8ths, 10ths, 12ths and 16ths scales is the kind you want.

(n) *Nail Set.*—A nail set is a bit of hardened

steel with an oval top and a concave tip. The B size, which has a tip of $\frac{3}{32}$ inch, is a good size where only one set is used.

(o) *Washita Oilstone.*—This oilstone is the best for sharpening wood working tools. It should be perfectly white, hard, of even, uniform texture and free from foreign substances. A stone 2 by 5 inches is a good size.

(p) *Bench Vise.*—A carpenter's bench vise is not an absolute necessity provided you have a regular machinist's vise. I shall tell you about the latter under the heading of *Metal Working Tools.*

How to Use Wood Working Tools.—Like everything else worth while, to become an adept in the use of tools requires practice. If you are a beginner in the craft of wood working here are a few hints that will start you off right and then you must do the rest with your brain and hands.

In using a hammer grasp the handle about 2 inches from the end and not too tightly. As you swing the hammer toward the nail it gathers force when held freely and not only is a harder blow struck but it does not jolt the arm.

When starting to saw a board place the teeth of the saw on the edge where you want to saw it. Hold the board with your left hand close to the saw and raise your thumb until it rests against the side of the blade of the saw as shown on Fig. 2, when it will act as a guide and keep it from slipping.

Molding for picture frames, electric light wires or

strips of any kind which are to be sawed off perfectly square or to fit corners should be sawed in the miter-box with the *back saw*. A block, or a smooth plane, should be set flat on the surface of the work that is to be planed and the pressure on the plane should



FIG. 2.—The right way to start a saw.

be applied equally, that is if it is already true and you want to smooth it up.

A chisel is used to cut out mortises and make grooves and it can be used to smooth up places which you cannot reach with a plane; it should always be held with the beveled edge out and up from the surface it is cutting and this is also true of gouges. Fig. 3 shows the proper way to use it.

To bore a hole straight and true with a brace and bit start it and then *sight* the bit from the point and

on the side to see that it is plumb and hold it as shown in Fig. 4.

A gimlet is good to make holes for starting screws, but whatever you do don't drive screws with a hammer. Bore out holes in hard wood with a gimlet,



FIG. 3.—The proper way to hold a chisel.

or a drill, before driving in screws with a screw driver.

In chipping or chopping with a hatchet, or Boy Scout ax, hold it quite firmly so that it will not slip. Where the work is exposed or where it is to be painted afterward sink the heads of the nails into the wood with a nail set. Use wire nails and rub the ends of them with a piece of soap before driving as this will make them go in easier and the wood less liable to split.

Finally whenever you start a job mark out the work carefully with your try square and make every measurement accurately with your rule, for more botched jobs result from the lack of care than from the unskillful use of tools. So think first and then go ahead.



FIG. 4.—The correct way to bore a hole.

How to Sharpen Wood Working Tools.—To do good work all edged tools must be kept sharp. To sharpen your saws yourself you will need a *hand saw taper file, a saw vise* (35c.) and a *saw set* (70c.). If you are a beginner it is just as well to let a saw-filer keep your saws in order.

The cutters of your planes and your chisels are sharpened on your Washita oilstone. Put a few drops of machine oil on the stone and hold the cutter,

or chisel, so that the beveled edge lies flat on the stone, press hard on the out stroke and ease up on the back stroke.

Metal Working Tools.—While nearly every household has a few carpenter's tools very few of them can boast of any machinist's tools and yet the latter are indispensable where odd jobs of all kinds are to be done. The following metal working tools are the most needful:

	TOOL	COST
(a)	Jeweler's hammer	$.35
(b)	Machinist's hammer	.50
(c)	Center punch	.10
(d)	Cold chisel	.20
(e)	Tinner's snips	.90
(f)	Drill stock and drills (Drills about 10c. each.)	1.15
(g)	Hack-saw frame and saws	1.00
(h)	Gasoline torch	3.50
(i)	Soldering copper	.50
(j)	Flat nose, side cutting pliers	.75
(k)	Long nose pliers	.25
(l)	Round nose pliers	.25
(m)	Monkey wrench	.50
(n)	Screw drivers	.15, .30
(o)	Files, 4″ long	.10, .15
(p)	Spring dividers	.50
(q)	Boy Scout knife	.75
(r)	Oil cans	.10, .15
(s)	Carborundum oilstone	1.50
(t)	Taps and dies	3.25
(u)	Machinist's vise	1.50

(a) *Jeweler's Hammer.*—This is a very small *ball peining* hammer weighing only 3 ounces. It is made

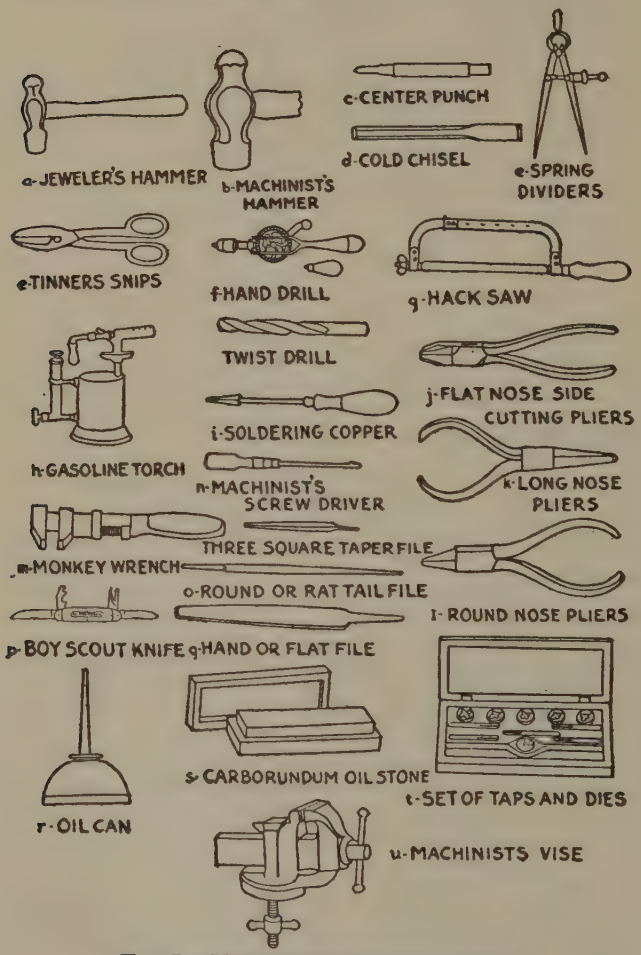


FIG. 5.—Metal working tools you need.

exactly like a machinist's hammer and is very useful for all kinds of light work. It is shown in Fig. 5.

(b) *Machinist's Hammer.*—This is a *ball peining* hammer made of cast steel. It should weigh about 1 pound.

(c) *Center Punch.*—A center punch is used to accurately make a dent in a piece of metal work at a given point so that it can be scribed, drilled, etc.

(d) *Cold Chisels.*—These are used for chipping off pieces of iron, cutting through metals, etc. Get two sizes $\frac{1}{4}$ and $\frac{1}{2}$ inch in diameter which are 4 inches and $5\frac{3}{4}$ inches long respectively.

(e) *Tinner's Snips.*—These are large shears for cutting thin sheet metal of all kinds. A pair of snips 11 inches long and having a cut $2\frac{1}{2}$ inches long is an easy size to handle. They should be made of forged steel.

(f) *Drill Stock and Drills.*—A drill stock is a device for rotating the drills at a goodly speed. The handles of most drill stocks are made hollow and contain half-a-dozen *fluted drills;* these are good enough for drilling wood but Morse twist drills should be used for drilling metals.

(g) *Hack-saw Frame and Saws.*—This is a tool for sawing metals. Get a frame that is adjustable so that it will take a saw blade from 6 to 12 inches long and then buy half-a-dozen 8-inch saw blades for it.

(h) *Gasoline Torch.*—This kind of a torch is a necessary part of every kit of tools. The tank holds

about a pint and the torch weighs about 1¾ pounds.

(i) *Soldering Copper.*—Buy a small one weighing 5 or 6 ounces. It will be about 12 inches long and it should be made of pure copper which is then *tinned.* A ½-pound bundle of *wire solder* and a 2-ounce can of soldering paste for the *flux* will serve most purposes.

(j) *Flat-nose, Side-cutting Pliers.*—A pair of regular *telegraph pliers* 7 inches long and hand-forged will give you good service for all round work.

(k) *Flat-nose Pliers.*—A 4-inch pair of pliers of this pattern are useful to hold metals with when soldering and in many other ways.

(l) *Round-nose Pliers.*—These are used for bending wire and sheet metal into rings and other shapes. A 4-inch pair is a good size.

(m) *Monkey Wrench.*—This is the well-known adjustable wrench invented by Charles Monkey. Get the kind known as a machinist's screw wrench and you will have a good one. An 8-inch wrench is large enough.

(n) *Screw Drivers.*—Two screw drivers are needed, a small one with a blade 2½ inches long, ¼ inch wide and sharp for small screws, and a large one with a blade 6 inches long, ⅜ inch wide and blunt for large screws. These screw drivers can be used for either wood or machine screws.

(o) *Files.*—Files are used for cutting away and smoothing up metal objects. Four files are needed and these are (a) two *hand* files; (b) a *round* file,

and (c) a *three square* (three-cornered) file. For the small hand file get one 4 inches long and *smooth cut* for finishing flat surfaces, and get a large hand file 8 inches long and *single bastard cut* for rough work. A 5-inch *round* or *rat-tailed* file for enlarging round holes and a 5-inch *three square, double cut* file for clearing out sharp corners, filing internal angles, etc., will complete the list.

(p) *Spring Dividers.*—These are used to scribe circles on wood, metal and leather as well as for spacing. A pair of 4-inch spring dividers with either a spring or a solid nut will do for all small work.

(q) *Boy Scout Knife.*—Though hardly a machinist's tool it is first, last and all the time a useful tool. So get one.

(r) *Oil Cans.*—A brass or zinc *oiler* about 3 inches in diameter filled with the best sewing machine oil should be kept within easy reach. A poor grade of oil gets gummy and defeats the very purpose for which it is intended. A sewing machine oiler is also a convenient thing to have.

(s) *Carborundum* [1] *Stone.*—The India oilstone is made of *carborundum,* the hardest and sharpest of all known abrasives, the diamond alone excepted, and hence it makes the fastest cutting oilstone. A good size is $1\frac{1}{4} \times 1\frac{3}{4} \times 8$ inches, and it should be mounted in a box to protect it from dust.

(t) *Taps and Dies.*—A set of taps and dies should be in everyone's kit of tools, for with them you can

[1] Carborundum is an electric furnace product.

cut threads on metal rods, rethread machine screws, cut threads in nuts and tap out holes of all kinds. A No. 1 set of machinist's taps includes a stock 7 inches long to hold the dies and tap wrench. There are five tap cutting threads, $\frac{1}{8}$, $\frac{5}{32}$, $\frac{3}{16}$, $\frac{7}{32}$ and $\frac{1}{4}$ inch. The threads of the dies are the same in number and size as the taps.

(u) *Machinist's Vise.*—A bench vise with steel jaws $2\frac{1}{2}$ inches wide fitted with a swivel base and chill hardened anvil can be bought for as little as $1.50. Better vises can, of course, be had for more money.

(v) *Other Tools.*—Some other tools will be needed for special purposes, but you can buy these as you have occasion to use them.

How to Use Metal Working Tools.—To cut thin sheet metal with a pair of snips hold them in your hand, but if the sheet is rather thick let the lower blade of the snips rest on your bench, as this gives you more leverage than when the snips are held free.

When drilling holes, especially with a small drill, be careful not to press down too hard or you will surely break it.

Care must be taken in using gasoline for the torch, as the former is highly inflammable. To heat the soldering copper make a frame of $\frac{1}{8}$-inch iron wire, as shown in Fig. 6, to lay the copper on and so that its tip will be held directly in the flame of the torch.

Keep the copper well tinned, and this can be

done by filing it off occasionally, then heat it and rub it on a pine board on which you have placed some *yellow resin* and bits of solder. The copper will soon take on a bright coating of tin.

When filing metals press down on the file on the

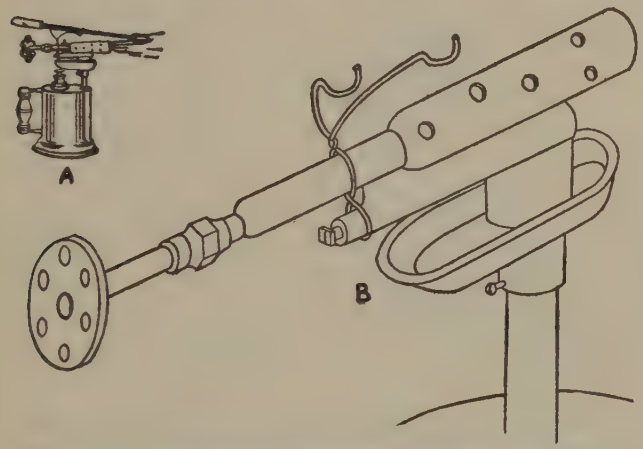


FIG. 6.—A wire holder for your soldering iron. A. How it is used. B. How it is made.

out stroke and lift the file clear of the work on the back stroke. If the work is secured in a vise and a large file is used hold the tip of the latter with your left hand, as this will enable you to apply more pressure and the file can be held in position better.

To scribe circles with the dividers see to it that the points are kept true and sharp, and if they are spring dividers always open them when you have finished, as this prevents fatigue of the spring. Be-

fore using the dividers always indent the starting point with the center punch first.

When cutting threads with either taps or dies don't attempt to turn the stock in which the tap or the die is held just as though you were putting in a screw or screwing on a nut. The safe way is to give the stock a half turn and then turn it back a half

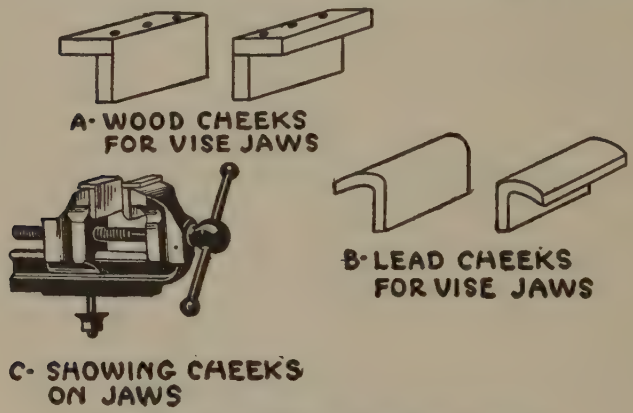


FIG. 7.—A vise with wood and lead cheeks.

turn, now give it a full turn and turn it back half a turn, for in this way a double cut is made. Use plenty of machine oil when threading iron or soft steel.

Should the machinist's vise be used for holding woodwork make two angle cheeks of wood as shown at A in Fig. 7; by putting these on the jaws of the vise the rough surfaces cannot mar the work that is held in it. Where fine metal parts are to be held in

the vise make a pair of cheeks by bending over a couple of pieces of sheet lead and placing these on the jaws as shown at B in Fig. 7.

Taking Care of Your Tools.—The best way to keep tools nice and bright is to use them. Rub up all the polished steel parts with machine oil and powdered pumice stone whenever you think they need it and sometimes oftener, and wipe off all of the tools with a clean cloth or a bit of waste.

Your Workshop.—It is not at all necessary to keep your tools in a box or a drawer if you have a shop where you can safely leave them. If not then make a cabinet with a pair of hinged doors, fit it with a lock and key and screw it to the wall. Arrange a place for every tool so that you can instantly get at it.

Your workshop may be a room of any size anywhere in the house, barn or garage. A basement is a poor place for a shop because it is usually badly lighted, often damp and seldom ventilated properly.

An attic room is better, but to be of the greatest service your shop should be an easily accessible place, with plenty of sunshine and air, which is cool in summer and warm in winter. In this room build up your bench and fasten your vise to it within a foot or two of the left-hand end.

You can easily make a bench by using 2 x 4 scantlings for the legs and 2-inch thick boards for the top. The legs can be braced with *furring* strips, which are strips 1 inch thick, 2 inches wide and 12 feet long. The bench should be about 2 feet 8 inches

high, 2 to 3 feet wide and from 4 to 6 feet long. It can be nailed or screwed together.

Make a couple of drawers for the bench, fix up some shelves over it and put up hooks and holders for such tools as can be taken care of in this way. Half the pleasure in doing a job around the house is

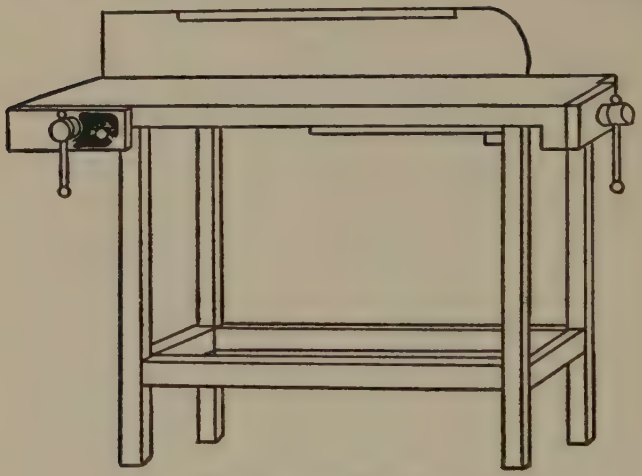


FIG. 8.—A good bench.

to know just where to lay your hand on the tools and the material you need, and for this reason you should, after every job, put everything in its place. A work bench like the one pictured in Fig. 8 can be bought for less than $10.00.

With the tools I have described you are ready to tackle any kind of a job from making a *dutchman* to opening a jewel box.

Materials You Need.—The materials you will need in the course of your operations will be many and varied, but a good plan is to buy the things as you need them, put the surplus away in separate boxes, except wire, label them and set them on the shelves in plain sight. Then when you want a ¾-inch brass screw or a few upholsterer's tacks you will know exactly where to find them.

CHAPTER II

INDOOR MECHANICS

Having the tools to do things with and a shop to do them in you are fit and ready to begin actual work, and it won't make very much difference where you start as you will always find enough to keep you busy.

How to Clean a Clock.—Clocks stop more often because they need cleaning than because they are broken, and a clock-maker will charge nearly as much to either clean or fix a cheap clock as a new one costs.

Take for instance an alarm clock. I know a family where they have half-a-dozen standing on a shelf and then they have to depend on a neighbor's rooster to wake them up. To clean an alarm clock you begin by taking the works out of the case. To do this unscrew the two legs at the bottom of the case; next unscrew the bell which carries the alarm stop with it, and unscrew the thumb screw that winds up the main spring, the thumb screw that winds up the alarm spring, the thumb screw that sets the hands, and the thumb screw that sets the alarm.

In cheap alarm clocks, as in A, Fig. 9, thumb nuts with slots cut in them are used instead of thumb screws for setting the hands and alarm, and you can

pull them off with your pliers. With these off, the back of the clock can be removed when the works are exposed.



FIG. 9.—A. An ordinary alarm clock.

Take the works out of the case as shown at B in Fig. 9, and be careful not to break the crystal. Next take off the minute, hour and alarm hands and the face. You will find the works screwed to an iron

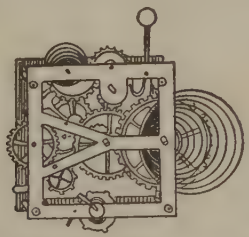


FIG. 9.—B. The clock taken out of its case.

plate, and this should also be unscrewed and laid aside; finally let the main spring and alarm spring run down so that the coils are as far apart as possible.

You do not need to take the works apart to clean them, but put them in either a strong alkaline solution or in benzine. To make an alkaline cleaning solution put one tablespoonful of liquid ammonia in two quarts of water and dissolve a lump of pure castile soap as large as a hen's egg in it; mix thoroughly in an earthenware bowl or jar.

Immerse the works in this solution for an hour, remove them, set them where the wind will blow on them for ten minutes and then put them in a warm oven to expel the remaining moisture. When thoroughly dry oil the pinions by touching them with the end of a tooth-pick dipped in machine oil. Don't use too much oil and never use kerosene as it soon gums up and stops the clock.

Another way is to soak the works in half a gallon of benzine over night. When they are taken out the benzine will evaporate very quickly and the pinions can then be slightly oiled. *Bear in mind that benzine is a first cousin of gasoline and should never be used at night or near a flame.*

To Keep a Carpet Sweeper in Order.—An up-to-date carpet sweeper is simplicity itself. It consists of (1) a revolving brush which is turned by the wheels resting on the floor, (2) two dirt pans, one on each side of the brush, and (3) a lever so that the pans which are pivoted can be swung open and the sweepings removed.

The wheels seldom get out of order, but the brush requires care to get the best service from the sweeper.

If you will examine the brush you will find that there are five or more serpentine rows of bristles on it. When the brush gets clogged with ravelings don't try to pull them out until you have cut them so that the spaces between the rows of bristles are clear and open.

To clean the bristles dissolve a piece of washing soda as large as an egg in a couple of quarts of water. Dip the bristles into the solution, taking pains to keep the wood part of the brush as dry as possible. When the bristles are clean wash the brush in clear, cold water and set it in the sun to dry. Don't wipe the bristles, as this will soften them.

The only parts of a sweeper that should be oiled are the bearings that the brush sets in and the wheels, and use only a drop on each part. The right way to use a sweeper is to press lightly on the handle and run it with smooth, even strokes. Pressing hard does not take up any more dirt and only tends to wear out the brush.

Fixing an Oil-Stove.—When a *blue-flame* oil stove smokes or burns red instead of with a clear blue flame the good house-wife generally thinks it is caused by the wicks.

This untoward condition is usually due instead to (1) either water in the long feed pipe of the stove, (2) an obstruction either in the long feed pipe of the tanks or the short feed pipes of the burners which supplies oil to the wicks, or (3) the rusting of the valve which regulates the flow of oil to the burners.

To keep the stove in order it is a good scheme to clean it once every month or so. To do this lift the oil tank from the pipe. Get a piece of telegraph, or other stout wire, about 6 feet long and push it through the feed pipe until it sticks out of the other end and work the wire back and forth several times. Put a pint of ammonia in a couple of quarts of hot water and pour it into and through the feed pipe.

Take out the burner and remove the asbestos wick. On each side of the burner you will see a small hole, and to clean them out run a thin piece of wire about 8 inches long clear through the holes. Wash the burner in the ammonia water until it is perfectly clean and dry it.

Set the burner back in place and tilt the stove so that all of the water in the feed pipe will run out. Unscrew the valve wheel and at the end of the valve rod you will observe it is pointed and smooth for about $\frac{3}{8}$ of an inch. Rub up this end with a piece of fine emery paper and screw it back into place.

Screw the cap on the end of the feed pipe; put a strainer into the other end of the pipe, fill the tank with kerosene and it will work like a new stove.

To Solder Tinware.—It is easy to solder new tin by using *resin* or *soldering paste* for the *flux,* but to solder pots and pans that have been used the surest way is to make a soldering *fluid* by dissolving some clippings cut from a sheet of zinc in an ounce of *muriatic acid* and add a tablespoonful of water to it.

Do this out-of-doors and drop in a few clippings

at a time and further keep the solution well away from your tools as the fumes will quickly rust them.

Mending a Leaky Kettle.—The first thing to do is to find the leaks. To do this hold the kettle between your eyes and the light, and if the holes are fairly large you can easily see them; if they are small fill the vessel full of water, when a tiny drop will soon form on the outside over the hole.

Having found the hole scrape the metal all around it as clean as a hound's tooth. See to it that your soldering copper is well tinned and hot enough so that it will instantly melt the solder when it comes in contact with it.

Rub the soldering fluid over the brightened surface with a bit of a pine stick cut flat on one end like a paddle and the acid will cut off the grease and dirt which would otherwise prevent the solder from sticking.

Now hold the solder in your left hand with the end of it over the hole, and with the soldering copper in your right hand melt the solder with it as shown in Fig. 10. The solder will instantly begin to flow, and if you have followed the above instructions it will fill the hole and stay there.

Making a New Spout.—Should the spout of a tea or coffee pot melt off scrape the edges of it and the surface of the pot where it fits, clean and bright, and brush it over with the *soldering fluid*. You can then hold the spout on the pot and run a line of solder round the edge with your copper.

To put on a new spout take off the old one first; the easiest way to do this is to melt a little solder in the seam just as though you were soldering it on. The instant the solder melts slip the point of your knife between the spout and the pot and as fast as you melt the solder follow it up with your knife until it drops off.



FIG. 10.—It is easy to solder tinware.

Flatten out the old spout, lay it on a new piece of tin and scribe it with the sharp point of your center punch. Cut it out with your snips and bend it to shape on a broom-handle. Now try it on the pot, trim up the edges until it makes a good fit and solder it on.

Mending a Window Shade Roller.—It's a

little thing, but when it won't work what a hubbub it raises. A window shade that won't go up is even worse than one that won't stay down.

When the Shade Won't Go Up.—When a shade refuses to roll up properly it means that the spring is unwound, that it won't catch or that it is broken. If it is either of the first two troubles it is easy enough to fix.

First draw the shade down about a foot, then take the roller from the brackets, roll the shade up by hand, and replace the roller in the brackets. Try it and if it doesn't work pull the shade down a couple of feet, roll it up by hand, put it back and try it out again. Repeat this operation until the spring is wound up tight enough to make it self-acting.

When the Shade Won't Stay Down.—This trouble is caused by the spring being too strong and consequently the shade either rolls up at such speed the pawls at the end of the roller haven't time to drop into the slots and so lock it, or if the shade is rolled up slowly the spring is so strong the pawls are forced out of the slots. Fig. 11 shows the ratchet mechanism of a shade roller.

To weaken the spring take the roller from the brackets with the shade rolled completely up and then unwind the shade a foot or so and replace the roller in the brackets. If the shade still has a tendency to roll up without stopping take the roller out, unwind the shade a couple of feet, put it up and try it out

again. Keep on lengthening the shade until the spring has the right tension.

Sometimes dust keeps the pawls from acting properly, and if this is removed and the joints of the pawls are oiled a trifle they will work freely. If the

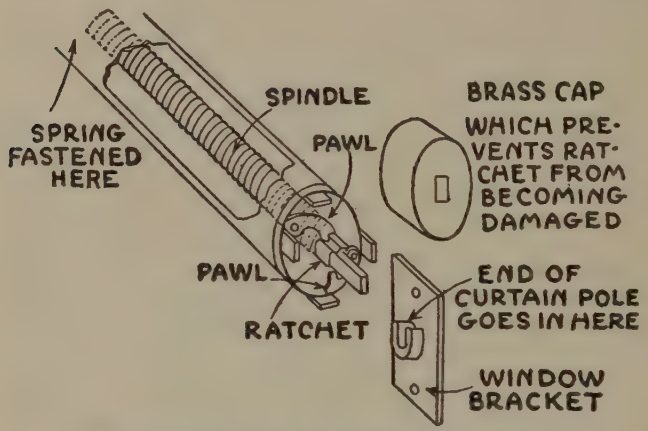


FIG. 11.—X-ray view of a window shade roller.

spring is broken it is cheaper to buy a new one than it is to repair it.

New Shears for Old.—Shears that have good blades very often become useless either because the screw that holds the blades together or the threaded holes in the blades are worn out or the blades have been sprung.

Cut out of spring brass, or of phosphor bronze, $\frac{1}{32}$ inch thick, a strip $\frac{1}{4}$ inch wide and $1\frac{3}{8}$ inches long; file it down so that it tapers at both ends; drill a $\frac{1}{8}$-

inch hole through the middle and bend it as shown at A in Fig. 12.

Take the old screw out of the shears and put a 6-32 machine screw ½ an inch long through the holes in the blades and then through the hole in the brass spring and screw on a nut as shown in Fig. 12. Tighten up the latter until the tension on the blades is just enough to make them cut easily. The spring

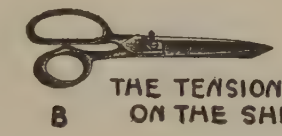




Fig. 12.—New shears for old.

compensates for any irregularities of the blades and you will have a pair of new shears for old.

The Right Way to Sharpen Knives.—There are two kinds of dull knives, and these are (a) knives that are slightly dull and (b) knives that have nicks in them.

A knife that has merely lost its keen edge can be sharpened on a carborundum oilstone. Hold the knife so that the blade lies nearly flat on the stone, as shown at A in Fig. 13; now press lightly on the blade and

draw it along in the direction of the arrows the length of the stone.

When you have reached the end of the stroke turn the blade over, as shown at B, and pressing with an equal force draw the cutting edge in the direction of the arrows until the other end of the stone is reached.

You can tell by the *feel* of the edge of the blade with your thumb whether it is sufficiently sharp, but *never draw your thumb along the blade* when trying

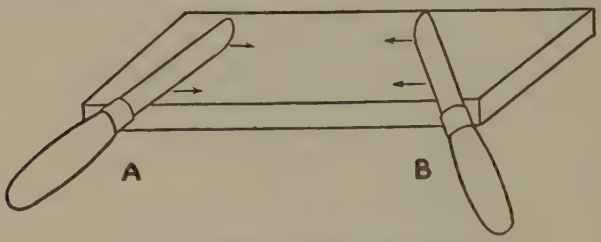


FIG. 13.—How to sharpen a knife.

it. A better way to test the cutting qualities is to hold a piece of stiff paper in your hand and slice it with the knife.

When a knife is very dull or has nicks in it, it should be sharpened on a grindstone, or if this is not to be had then use a *whetstone* (10c.), and when the edge is ground even it can then be sharpened on an oilstone, or *honed,* as it is called.

Never use a file or an emery wheel on a knife or any kind of a wood-cutting tool, for the first will put a burr on it and the second will take the temper out of it.

How to Repair Your Bicycle.—There are about five things that happen to a bicycle to put it out of commission which you can repair, and these are (1) loose handles on bar; (2) punctured tire; (3) bent or broken spoke; (4) broken link in chain, and (5) crooked rear wheel.

When the *handles get loose* and keep slipping off,

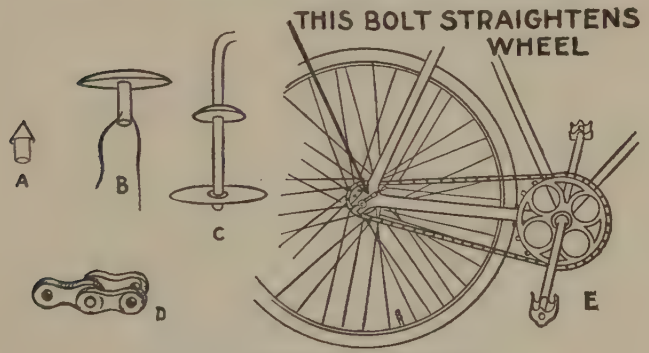


Fig. 14.—Making bicycle repairs.

clean the inside of them and wipe off the ends of the bars; now smear the ends of the latter with thick *shellac varnish,* push the handles on tight and let the varnish dry thoroughly before touching the handles again.

There are several ways to fix *a punctured single-tube tire,* but either of the following is good. The first way is to use a rubber plug as shown at A or B in Fig. 14. Whichever kind of rubber plug you use smear it with *rubber cement*—it can be bought at any bicycle store—force the large end through the

hole in the tire, holding the nipple on the outside and then pump up the tire, when the pressure of the air will keep it in place. The strings shown at B make it easy to hold the end of the plug, which should be trimmed off flush with the tire. Another kind of plug is shown at C in Fig. 14, and is made entirely of metal. The part that goes through the hole looks like a cuff button and a bent threaded brass rod on which a nut is screwed sets loosely in a slot in the oval button and this allows it to be turned in any direction. After the button is in the hole the nut is screwed down tightly and the projecting brass rod is cut off with a pair of pliers.

If a *spoke is bent* it can usually be straightened, but if it is broken the tire must be taken off and then you can unscrew the spindle-shaped nut which holds the spoke in place and whose end sets in the groove of the rim and is flush with it. When the nut is removed the bent end of the spoke which sets in the hub can be slipped out, the spoke taken out and a new one can be put in.

Sometimes a *link in the chain will break* and it is a good plan to always have a couple of reserve links in your tool bag. One of these links is shown at D in Fig. 14. The top bar can be taken off to put the link in the chain, and to keep the bar on there is a pivoted and slotted bar lock; the slots of the latter are set in the grooved ends of the spindle and when these are in place the end with the hole in it is sprung over the end of the spindle and this holds it fast.

Should the *rear wheel run crooked* it can be adjusted by screwing up the nuts shown at E in Fig. 14 until it is straight, or in *alignment* as it is called.

To Keep a Sewing Machine in Repair.—

A little drop of oil,
A little bit of care,
Saves a lot of toil,
Also a lot of wear.

To make a sewing machine work well is largely a matter of taking proper care of it, and this means that it must be kept clean and well oiled.

(1) After running the machine for a while the oil will become gummy and thick. In that case the machine oil should be *run out* with benzine, and when the old oil is *cut* wipe all of the parts off thoroughly with a clean rag. This done, oil the machine again with the best machine oil, and this you can buy at any sewing machine store.

(2) If the *stand* does not run easily free it with benzine as described above; (3) see that the belt is sufficiently tight to drive the machine and (4) tighten up all screws and nuts.

(5) When the feed of a machine does not work properly it is often caused by lint from the goods choking it up, and this is very apt to result where soft dress goods are sewed.

(6) To obtain a perfect stitch the upper and lower threads should be of the same size.

(7) The tensions largely determine the quality of the stitching and these should pull the stitch equally on each side. (8) If the thread lies in loops on the upper surface the upper tension is too tight, while if loops are formed underneath, the upper tension is too loose. (9) If the shuttle has a tension spring and it is out replace it with a new one.

(10) That part of the machine which carries the goods along is called the *feed*. The feed should be *timed* so that it will begin to carry the goods forward when the needle is well out of the work but not late enough to permit the needle to pass into the goods again before the feed has completed its forward movement.

(11) Among the causes of uneven feeding are, (a) too low a feed; (b) the feed parts worn too much, and (c) not enough pressure on the presser foot.

(12) A frequent trouble is the breaking of needles, and this is often caused by the needle touching or striking the needle plate or the shuttle; the remedy for this is to see that the needle works perfectly straight up and down.

(13) Needles break also because the needle plate is too small; the edge of the needle plate hole is too square, in which case you can bevel it off with emery cloth; the needle is too small and hence cannot stand up under the strain; the hook is too late; the presser foot is too close to the needle, and, finally, the needle-bar is too low.

(14) When the upper thread keeps breaking it is generally due to the needle being too small or the thread too large; too sharp an edge through which the thread passes, and this is often at the thread guides, and finally, that the needle is set too high or too low.

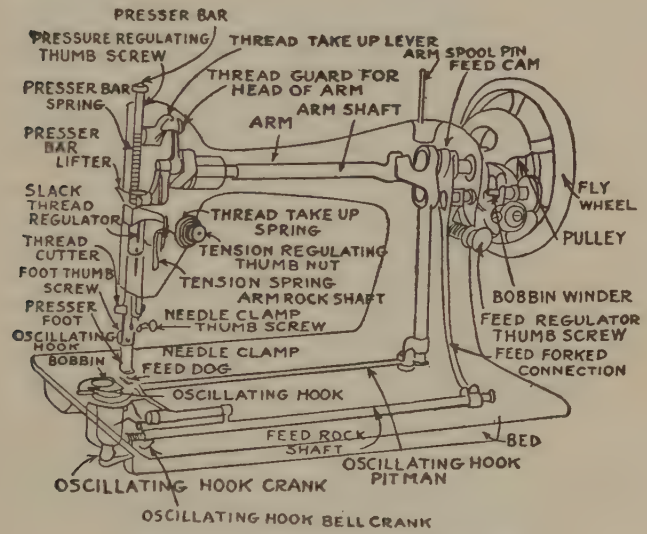


Fig. 15.—Parts of a sewing machine.

(15) Missed stitches are often caused by a bent needle or a bent needle bar; when the needle is not set straight in the bar; the needle striking the side of the presser foot or the needle plate; the needle being too large or too small for the cloth; not enough pressure on the presser foot; the needle being set too high or too low or the shuttle moving too fast or too

PROPER SIZES OF NEEDLES AND THREAD.

Sizes of Needles.	Class of Work to Sew.	Sizes of Cotton, Linen or Silk.
0	Very thin Muslin, Cambrics, Linen, etc.	100 to 150 Cotton, OOO, OO Silk Twist.
B	Very fine Calicoes, Linens, Shirtings, Fine Silk Goods, etc.	80 to 100 Cotton, O Silk Twist.
½	Shirtings, Sheetings, Bleached Calicoes, Muslins, Silk and general domestic goods and all classes of general work.	60 to 80 Cotton, A & B Silk Twist.
1	All kinds of heavy Calicoes, light Woolen Goods, heavy Silk, Seaming, Stitching, etc.	40 to 60 Cotton, C Silk Twist.
2	Tickings, Woolen Goods, Trousers, Boys' Clothing, Corsets, Cloaks, Mantles, etc.	30 to 40 Cotton, D Silk Twist.
3	Heavy Woolens, Tickings, Bags, Heavy Coats, Trousers, etc. Heavy Clothing generally.	24 to 30 Cotton, E Silk Twist. 60 to 80 Linen.
4	Bags, Coarse Clothes, Heavy Goods of any texture.	40 to 60 Linen or very Coarse Cotton.

slow. In any event use the best thread and the best needles and some of the troubles will take wings unto themselves and fly away. Fig. 15 shows all the parts of a Singer sewing machine.

Caution (1).—Never run the machine with the presser-foot resting on the feed without cloth between them.

Caution (2).—Practice upon strips of cloth and do not attempt practical sewing until you can guide the goods and at the same time produce a regular motion of the machine.

Caution (3).—Do not try to help the machine by pulling the goods, for this is apt to bend the needle; the machine moves the work without any assistance.

Caution (4).—Never run the machine when both the shuttle and the needle are threaded except while you are sewing.

CHAPTER III

BE YOUR OWN LOCKSMITH

How to Fix a Door Knob.—A loose door knob is very annoying and being no respecter of persons every household has one sooner or later.

The reason door knobs work loose is because the

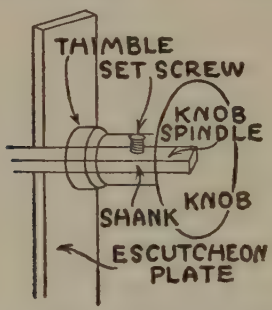


FIG. 16.—Phantom view of a door knob.

threads of the screw which hold the knob on the spindle or the threads in the spindle, or both, wear off. See Fig. 16. To tighten the knob tap out the screw hole, slip one or more washers over the spindle close up to the escutcheon plate, put the handle on the spindle again and screw in a new screw.

How a Lock is Made.—To know how to pick a

lock or how to make a key for a lock the first thing you should do is to learn how a lock is made.

Door Locks.—Ordinary door locks are of two kinds, and these are (1) *rim* locks, and (2) *mortise* locks. A rim lock is the kind that is screwed to the

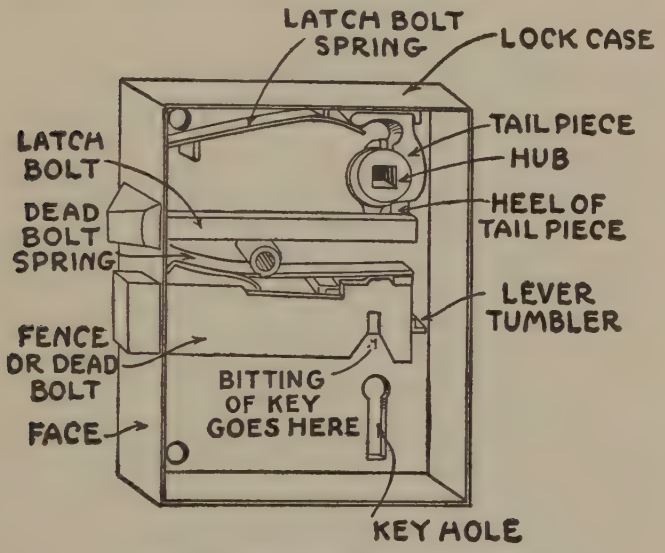


Fig. 17.—The inside of a door lock.

outside of the door, while a mortise lock is set in a mortise in the edge of the door.

The advantages of a mortise lock over a rim lock are (1) that there are no unsightly projecting parts; (2) it cannot be broken off by pressure applied to the outside, and (3) it cannot be tampered with from the inside.

These ordinary door locks are of the *lever-tumbler* type, that is, the lock is worked by one or more pivoted levers, or tumblers, the construction of which is clearly shown in Fig. 17. The simplest form of this lock has only three parts, and these are (1) a bolt, called a dead-bolt; (2) a lever-tumbler, and (3) a spring. In some locks (A) the lever rests on top of the bolt, and in others (B) the bolt rests on top of the lever, and but for this small difference they are quite alike.

A matter of a little more importance is that in a lock of the first, or (A) kind, the *ward notch,* or *bitting,* as locksmiths call it, slips over the lever and the bit of the key forces the latter up and throws the bolt over, while in the second or (B) kind the ward notch slips over the bar of the bolt and the bit then raises the lever and throws over the bolt.

On both the bolt and the lever there is a projecting piece of metal—the one on the bolt is called the *fence,* and the one on the lever is called the *gating*—the purpose of which is to keep the bolt in position, or locked, when it is thrown back as well as when it is thrown out, and to the end that this may be done a flat steel spring is fixed in the lock so that one of the ends presses down on the lever; now when the bolt is clear in or clear out the gating on the lever engages the fence on the bolt and the spring prevents them from slipping past each other, or in other words the bolt is locked.

This is all there is to a simple lever-tumbler lock,

but you should by all means take one off a door, unscrew the cap and examine its construction and action when you will know more about a lock in five minutes than you probably knew in all your life before.

Dresser Drawer Locks.—The average lock on a dresser drawer is far more simple than the door lock

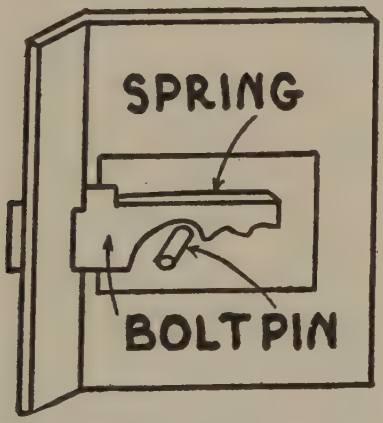


FIG. 18.—The inside of a drawer lock.

just described since the whole mechanism consists solely of a bolt with a small straight steel spring fixed to it to give it tension.

There is a half round cut made in one side of the bolt and any kind of a barrel key with a blade on it having the right length will open it. Fig. 18 shows a lock of this kind with the back removed.

How to Pick a Lock.—*Door Locks.*—From the construction and operation of rim and mortised locks

it must be clear that in order to open a lever-tumbler lock it is only necessary to force up the lever when the bolt can be easily thrown.

Now if a door is locked and the key is lost bend a piece of steel wire about $\frac{1}{8}$ inch in diameter and $4\frac{1}{2}$ inches long to exactly the shape shown at A in Fig. 19, which is a half-sized lock pick with a pick on each end.

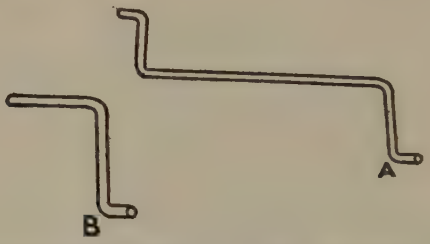


FIG. 19.—Lock picks. A. Door lock pick. B. Dresser lock pick.

To open the lock put the pick into the key-hole with the projecting end up and then without turning it *press it up,* when it will strike the lever, raise it and so release the bolt; still pressing the pick tight against the lever turn the pick to the left if you are on the outside of the door, or to the right if you are on the inside.

When you turn the pick the projecting end presses against the V-shaped notch in the bolt and this turns the latter back.

Dresser Drawer Locks.—To make a pick to open a simple lock of this kind all you have to do is to

bend over the end of a stout wire as shown at B in Fig. 19. Put the bent end of this wire into the keyhole, to one side of the pin, and by turning it round you can easily get it into the half-round cut of the lever and throw it back.

How to Make Keys.—It is a mighty good plan to save all of the keys you find lying around loose, for it is often possible to get one that will fit a lock, and this saves the time and trouble of picking it and of making a key.

But for fear that you might have to make a key you should have a dozen *key blanks* as they are called,



FIG. 20.—A warding file.

that is, keys in which ward notches have never been filed, and these can be bought of any hardware dealer for a few cents each.

In fitting keys to locks you should have a couple of *warding files,* as shown in Fig. 20, that is, files made especially for locksmiths for filing the ward notches, or bittings, in keys. To fit a key to a lock that has been taken from a door is easy, for you can see and measure the length of the bit and the depth of the ward notch in it and file it accordingly. But to fit a key to a lock on the door is somewhat harder. A door key is shown in Fig. 21.

A good way to find the exact position where the ward notch should be filed in the bit, smoke the latter

by holding it over a lighted match. Now when you insert the key turn it to the right and left as far as it will go; in striking the lever-tumbler or the dead-bolt the smoke will be rubbed off and you can file a ward notch into the bit where it is rubbed bright.

In the kind of a lock where the edge of the bit in the key throws over the bolt, if the bit is too long the key can be turned only part way round and if the bit

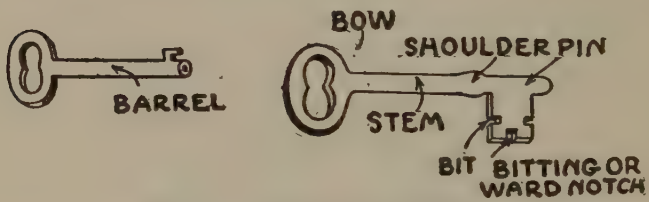


FIG. 21.—A door and a dresser key.

is too short the bolt will be thrown only part way in or out. But in the kind of a lock where the ward notch of the bit fits over the bolt and works it if the notch is not filed deep enough the key cannot be turned completely around, and if the notch is too deep the bolt will not be thrown either in or out far enough.

Notwithstanding these little peculiarities it is not at all hard to fit a key after you know how a lock is made and how it works. And the very best way to know these things is to take a lock apart and see for yourself just what goes on inside of it, then when a key is lost you will understand exactly how to give

first aid to the careless person, and that is to pick the lock and then make a new key.

A dresser drawer key is made a little differently from a door key in that it has a *barrel* instead of a *pin,* and the lock has a pin over which the barrel fits as shown in Fig. 21.

CHAPTER IV

DOING ELECTRICAL JOBS

There are always a lot of odd electrical jobs to be done around a house, whether it is wired for lighting or not, and by doing them your genius will shine forth even as an incandescent light does on the front porch at night.

Charging New and Recharging Old Batteries.—There are two kinds of batteries in general use for ringing bells, working annunciators, operating telephones, etc., and these are (a) *dry* batteries, and (b) *sal ammoniac* batteries.

A battery is made up of two or more *cells* connected together. A dry cell battery can be used to good advantage wherever it can be set in a perfectly dry place, but if the battery is likely to get damp, as it sometimes does in a basement, then a sal ammoniac battery should be used.

Recharging Dry Cells.—Dry cells are so cheap and last so well it is hardly worth while to try to recharge them when they are run down. It can be done to a certain extent by drilling several $\frac{1}{8}$-inch holes through the asphaltum top and pouring in each hole a few drops of a solution made by adding 1 ounce of sulphuric acid to 3 ounces of water, filling

the holes with either pitch or soap and letting the cell stand overnight. This will start up the action of the cell, but the current will not be very strong nor will it last very long. It will serve as a makeshift however until some new cells can be ordered and installed.

Charging Sal Ammoniac Cells.—A cell of this kind consists of a glass jar, a cylinder of pressed carbon and manganese and a rod of zinc. To charge a new cell fill the jar two-thirds full of warm water, put in 4 ounces of sal ammoniac and stir with a stick until it has completely dissolved. Set the cylinder in the jar and slip the zinc rod into the middle of the cylinder when the cell will generate a current in a very short time.

To Recharge Sal Ammoniac Cells.—When a sal ammoniac cell gets out of order it is usually due to the solution being worn out or to the zinc having been eaten away.

Whatever the cause take the carbon cylinder out of the jar and immerse it in a jar of hot water; clean the battery jar and fill it with a fresh solution of sal ammoniac; then replace the carbon and either clean the old zinc rod well or better put in a new one, when the cell will deliver a current.

Testing Out Electric Bell Circuits.—When an electric bell will not ring and you are commissioned to fix it you can find the trouble by a process called *elimination.*

The first thing is to test out the battery and to

do this properly you should have an extra electric bell. Connect the binding posts of the bell directly

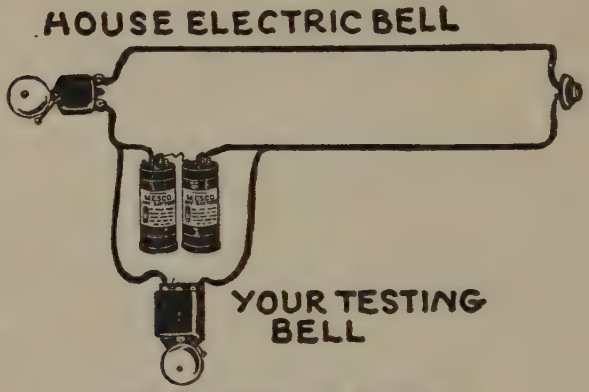


FIG. 22.—Testing out the battery.

with the zinc and carbon ends of the battery as shown in Fig. 22, and if your bell fails to ring, clean and recharge, or renew the battery. If it rings it shows that the battery is O. K., and then you should test out



FIG. 23.—Testing out the bell.

the other bell, which can be done by trying it with a dry cell as shown in Fig. 23.

If it fails to ring you will know that it is out of adjustment or that a screw is loose. Clean the platinum contact point of the adjusting screw and the little platinum contact disk under the latter and which is fixed to the trembler; then tighten the adjusting screw until it just makes contact with the platinum disk.

Test it by connecting it directly to the battery again, and when you have it in adjustment set the

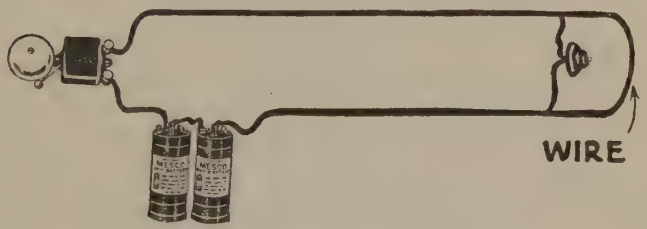


FIG. 24.—Testing out the push button.

nut on the screw good and tight to keep it from working loose. Tighten up the binding post and other screws to which the wires of the bell are fastened and screw the bell back where you took it from.

Should the bell ring when you test it out with the battery, or on *short circuit* as it is called, and still not ring when you press the button of the bell circuit you will know that the trouble then is either due to a broken wire or that it is in the push button. Short circuit the push button as shown in Fig. 24 by connecting a piece of wire across the circuit so that the current does not have to go through the push.

Now if the bell fails to ring something is wrong with the wires, and you will have to follow them along and test them as you go until you find the break. If the bell rings on short circuiting the push button but does not ring when you push the button, clean the contacts, see that the wires outside of it are not broken and that they make good connection with the screws. These things done, put the push back in place and the bell is guaranteed to ring.

When bare wires are used for the lines and these get crossed and make a short circuit which cuts out the push button the bell will ring continuously, but if the wires should get crossed so that the battery alone is short circuited the bell will not ring, but the battery will soon run down. By examining the battery, the bell, push button and circuit you will have no difficulty in finding the trouble and righting it.

Testing and Fixing Telephones.—Where regular telephone service is used the company has its own *trouble men* and they attend to fixing the telephones, but where *interior telephones* are installed in the house you are the one the folks will look to to fix them up.

The ringing apparatus of interior phones is an ordinary bell system which is energized by ordinary batteries, and if these should fail in their operations look after them as described above under the caption *Testing Out Electric Bell Circuits.*

A telephone transmitter has a little pocket in it

filled with *carbon granules,* and taking one of these apart is very like taking a watch to pieces—in that it is hard to get it all back together again. Sometimes a transmitter gets *packed,* that is, the granules get packed too closely together, and this prevents clear articulation; by tapping the edge of the transmitter gently with the handle of a screw driver the granules



Fig. 25.—A. A gravity drop annunciator.

are separated, and this improves the transmission of the voice.

It is seldom that the receiver needs attention, but it is well to keep the cover screwed down tight. The contacts of the switch-hook should be kept clean, and if you will look after these little details your telephone will always work well.

Testing and Fixing Annunciators.—An annunciator is a device operated by electromagnets for showing a number, or a name, and at the same time ringing a bell when a corresponding button is pushed, thus giving a visible and an audible signal at the same time. See Fig. 25 A.

The principle on which an annunciator is worked is this: a push button and battery are connected in circuit with an electromagnet, and in front of the latter there is a bent lever made of iron and a part of which forms the armature; this lever is pivoted in the middle, the lower and front end has a small catch on it and the upper and rear end is slightly weighted to keep the armature away from the magnet.

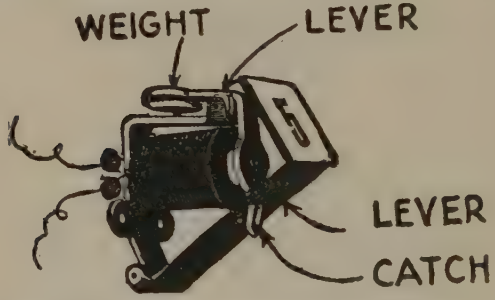


FIG. 25.—B. The electro-mechanism of a gravity drop.

A second, or drop lever, is pivoted at the rear end, while the front end, which is bent up, carries the name, or the number, and this lever has a slot cut in it so that when it is raised up it slips over the catch in the armature lever and is held there as shown at B in Fig. 25. When the drop is screwed in its case and the number is up it cannot be seen.

Now when the circuit is closed by a push button the magnet is energized and this draws the armature to it when the catch slips back and so releases the number lever, and it drops down to the position

shown by the dotted lines at B when the number is exposed through the clear glass of the case.

Now suppose there are four of these *gravity annunciator drops,* as they are called, in one case with a bell on top, then there can be four push buttons in different parts of the house. This brings five separate wires into the annunciator box, since one serves as the return wire for all of the drops and the bell, and the others lead to the basement or wherever the battery is located, and from there the circuits branch out to the push buttons as shown in Fig. 26.

Instead of running these wires separately from the annunciator to the basement you can get any number of wires you like in a cable and each wire will be of a different color so that you can instantly tell where the wire runs to. Occasionally the number lever will have to be bent a little to make it catch or release the drop lever properly, but this is all the adjustment that is ever needed. Testing out the circuits is done in exactly the same manner as described for electric bells.

How to Make a Refrigerator Alarm.—To always remember to empty the *drip-pan* of the refrigerator is a pretty hard thing to do, and when it overflows it is not only a great annoyance but sometimes causes considerable damage.

You can easily make an alarm so that when the water in the drip-pan reaches a certain level an electric bell will ring until the pan is emptied.

The alarm consists of an electric bell, a dry cell

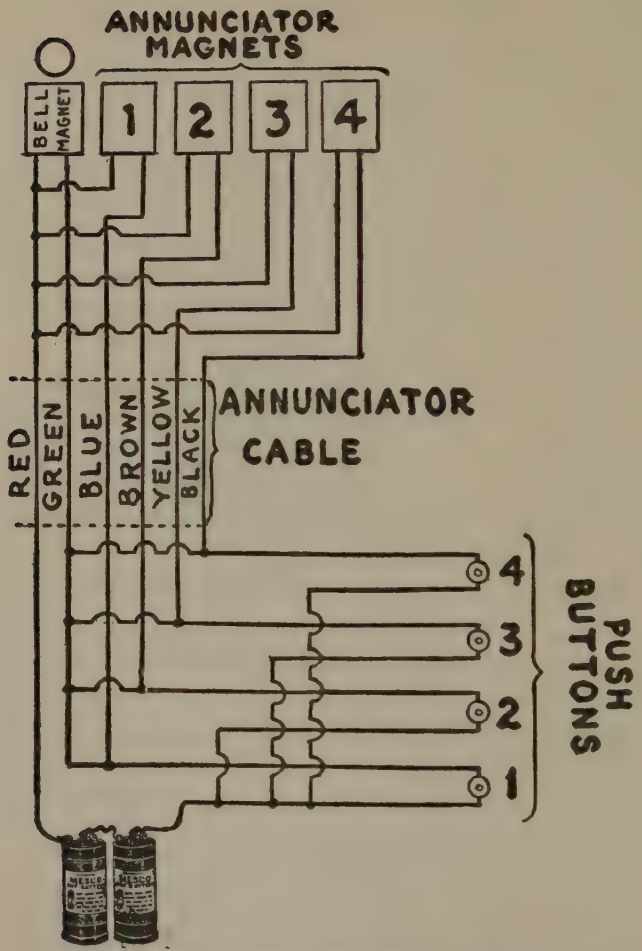


FIG. 26.—Wiring diagram of a four-drop annunciator.

and a *float* as shown in Fig. 27. To make the float, Fig. 28, saw out a block of wood ½ inch thick and 3 inches square; bore a ¼-inch hole through the center

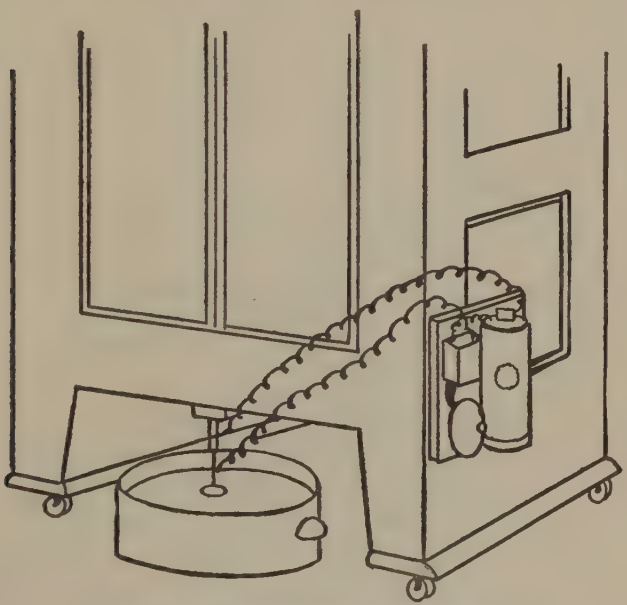


FIG. 27.—An electric refrigerator alarm.

of the block and fit a piece of brass tube ¼ inch in diameter and 2½ inches long into it.

To the lower end of the tube solder a strip of flat spring brass and run a little solder around the end to make the bore a trifle smaller; also solder a short length of No. 20 double cotton covered wire to the tube. Next take a piece of brass rod ⅛ inch in

diameter and 3 inches long, thread it two-thirds of its length and drop a bit of solder on the end to make it a trifle larger so that it can't slip out of the lower end of the tube.

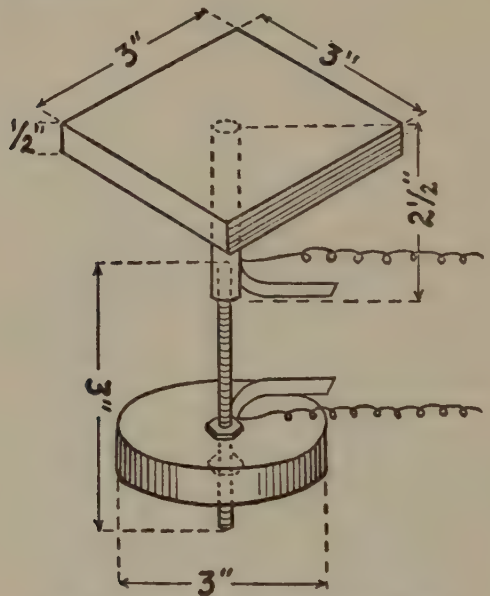


FIG. 28.—The float for the refrigerator.

Get a piece of flat cork ½ inch thick and 3 inches in diameter and drill a ⅛-inch hole in the center. If a cork of this size is not at hand take a number of smaller corks and fasten them together with wire instead. This done, make a flat brass spring like the first one, only drill a ⅛-inch hole in one end of it, screw a nut on the rod until it is 1½ inches from the

end, slip on the brass spring, loop a 3-foot piece of No. 20 double cotton-covered wire around it, screw on another nut to hold the spring and wire on tight, slip the cork on the rod and screw on another nut to hold the cork in place. The cork can then be adjusted by means of the nuts.

Nail the wood block of the float to the bottom of

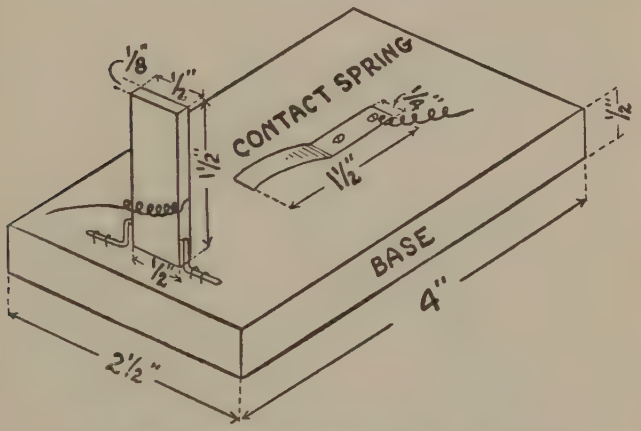


FIG. 29.—The contact device for the alarm clock.

the refrigerator near the drip-pipe; connect the wires leading from the float to the bell and battery, which may be fastened to the side of the refrigerator as shown in Fig. 27.

Now when the water rises in the pan it forces the cork up, and this brings the springs into contact, which closes the circuit and so rings the bell.

How to Make an Electric Alarm Clock.—To

make an alarm clock that won't have a friend in the world get an ordinary 98-cent alarm clock, an electric bell and a dry cell.

Then cut out a strip of brass $\frac{1}{8}$ inch thick, $\frac{1}{2}$ inch wide and $1\frac{1}{2}$ inches long. Drill a $\frac{1}{16}$ inch hole through the lower end as shown in Fig. 29 and a $\frac{1}{16}$ inch hole in the upper end; solder a very thin wire to the lower end of the bar and coil it up, the purpose of which will be seen presently.

Slip a wire through the lower hole and bend it to form a pivot or shaft for the brass bar to turn on, and bend it up enough to keep the bar clear of the base when it swings. Fasten the bent ends to a base made of wood $\frac{1}{2}$ inch thick, 3 inches wide and 5 inches long, with a couple of staples.

Cut out of spring brass a strip $\frac{1}{4}$ inch wide and $1\frac{1}{2}$ inches long, drill a $\frac{1}{8}$-inch hole in one end and bend up the other end as shown in Fig. 29. Screw this spring to the base and loop a piece of annunciator wire around the head of the screw and screw it down tight.

Connect the wire of the bar to a dry cell, fasten the wire of the spring to the electric bell and then connect the dry cell and the electric bell together. Take the bell off of the alarm clock, tie a thread around the hammer of the alarm, pass the other end of the thread through the upper hole in the bar and tie it fast as shown in Fig. 30.

Now when the alarm goes off the movement of the alarm hammer will pull the bar down, and when

this drops on the spring it closes the circuit and the bell will ring until you get up and attend to it. You won't like this alarm clock but you will always be on time for your coffee and cakes.

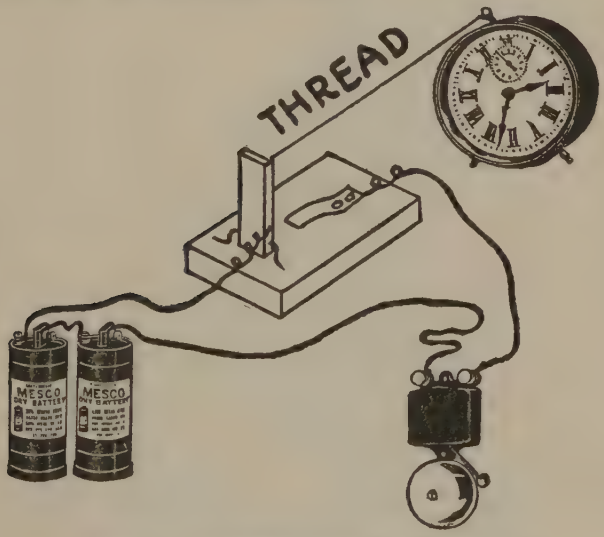


FIG. 30.—The electric alarm clock complete.

How to Make an Electric Door Alarm.—Sometimes it is a convenience to have a bell ring in the kitchen when the front door is opened.

To make a door alarm of this kind get an electric bell and a couple of dry cells. Now cut out two strips of spring brass $\frac{3}{8}$ inch wide and make one of them $1\frac{1}{2}$ inches long and the other $2\frac{1}{4}$ inches long. Drill three $\frac{1}{8}$-inch holes in the short piece for the

screws and binding post and bend over one end ¼ inch as shown in Fig. 31; drill three holes in one end of the other piece and bend it as is also shown in Fig. 31.

After fastening a binding post on each spring screw the long spring to the door case above and close

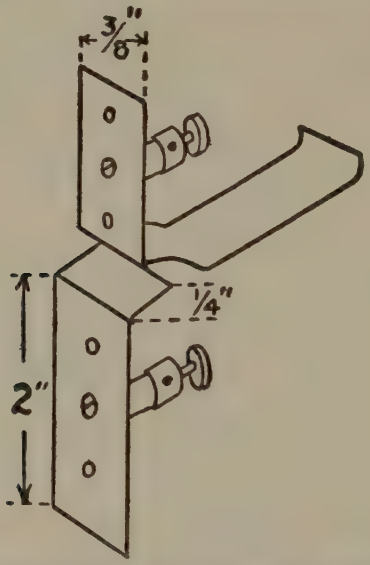


Fig. 31.—The contact for the door alarm.

to the hinge, and screw the other contact to the top of the door directly under the long spring so that as the door opens the two pieces of metal will rub on each other and so close the circuit.

Wire up the battery to the spring contact, connect the lower contact on the door with the bell and join

the bell and the battery together, all of which is clearly shown in Fig. 32.

When the door is closed the position of these contacts is like that shown in Fig. 31, and of course the



Fig. 32.—The electric door alarm complete.

circuit is broken; as the door opens the door contact strikes the spring contact and this closes the circuit and the bell rings. But as the door opens wider the contacts slip by each other, the circuit is broken and the bell stops ringing.

How to Make an Electric Fire Detector.—This fire detector, or *automatic fire alarm thermostat,* to call it by its real name, is so made that should a fire break out in the room in which it is installed the heat will expand the mercury in the tube and this closes an electric bell circuit.

To make a thermostat of this kind get a piece of

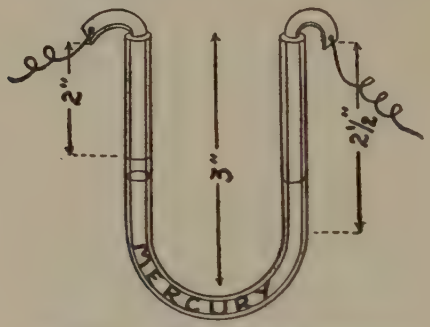


FIG. 33.—An easily made thermostat.

glass tube ⅛ inch in diameter, inside measurement, and not too thin, and have it a foot or so long. Hold it at both ends with your fingers in the flame of your gasoline torch and keep rolling the tube in order that all parts that are in the flame may be equally heated; when the glass is soft enough bring the ends together gently and slowly until you have formed a U tube of it.

When the tube is cold file a nick in each tube, or *leg,* as it is now called, with your three-cornered file 3 inches above the middle of the bend as shown in

Fig. 33, when it will easily break off by applying a little pressure to it about ½ inch on each side.

Put enough mercury in the tube to half fill it, cut

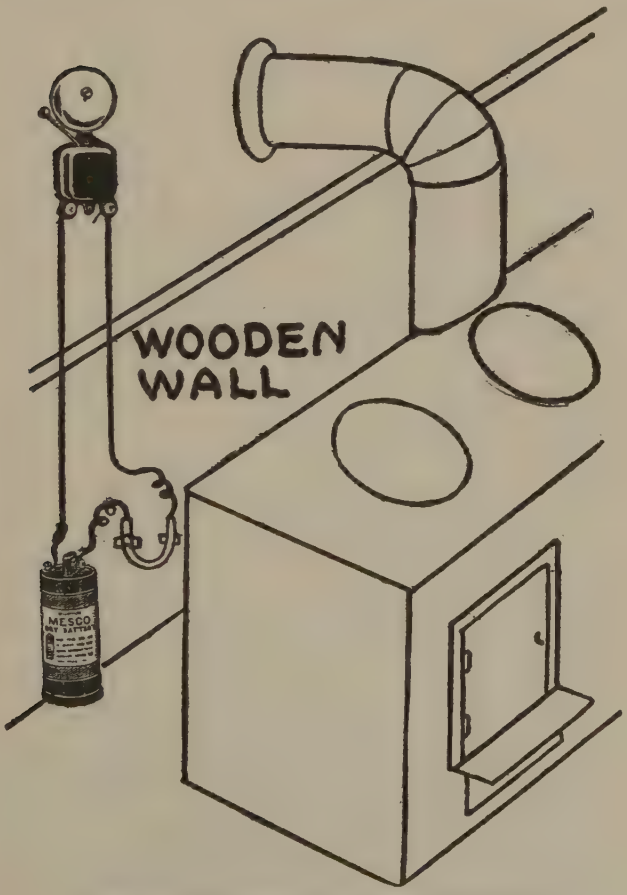


Fig. 34.—The electric fire detector installed.

off two strips of copper just wide enough to fit into the ends of the tube and about 2 inches long, solder a wire to each strip, put the latter into the end of the tube so that it will come to within $\frac{1}{4}$ inch of the mercury and bend the strip over to keep it in place.

If, now, you will connect the wires soldered to the strips with a bell and a battery and heat the tube the mercury will rise until it touches the lower tip of the strip, and when it does so the circuit will be closed and the bell will ring. The thermostat can be fastened anywhere there may be danger of fire, as for instance between the wainscoting and the cook stove as shown in Fig. 34, and when it gets hot enough the bell will ring out an alarm.

The thermostat should be adjusted to close the circuit when the temperature reaches 125 degrees Fahrenheit; you can do this by placing it in an oven with an ordinary thermometer, and when the latter indicates 125 degrees adjust the former accordingly. Metal thermostats already adjusted can be bought for as little as 60 cents.

How to Instal an Electric Gas Lighting Apparatus.—There are several kinds of *electric gas lighters,* or *burners,* as they are called, on the market, but all of them work on the same principle.

The scheme is this: When a wire, or a chain, is pulled down it causes a lever, which is pivoted to the burner, to raise a second lever; this has a bit of spring wire fastened to its tip and when this strikes and makes contact with a wire fastened to the jet and

breaks apart from another wire fixed to, but insulated from, the burner, a hot spark is made and this lights the gas.

In a plain burner, see A Fig. 35, there is no valve and the gas must be turned on first by means of the regular gas key. Another burner is made which

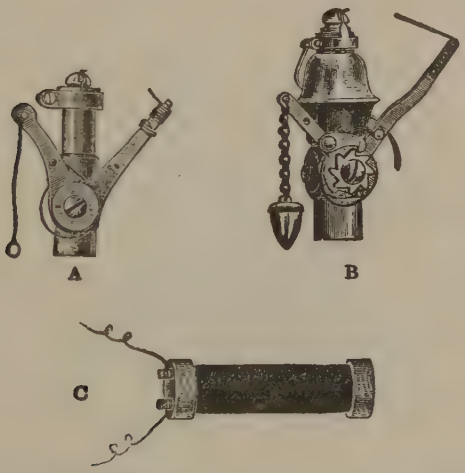


Fig. 35.—A. A plain electric lighting gas burner. B. A ratchet gas lighting burner. C. A gas lighting spark coil.

operates with a ratchet wheel and pawl, see B Fig. 35, the first pull of the chain turning on and lighting the gas and the next pull turning off and extinguishing the flame. A plain burner costs 50 cents and a ratchet burner costs about $1.00.

In order to produce a spark hot enough for lighting a gas burner with three or four cells of battery a

gas lighting spark coil must be connected in circuit. This is simply a coil of No. 16 or 18 double cotton-covered magnet wire wound on a soft iron coil, see C Fig. 35, and its purpose is to increase the intensity of the current, by the *inductive* action of one turn of wire on the one next to it, with the net result that a hot spark takes place between the contact pins

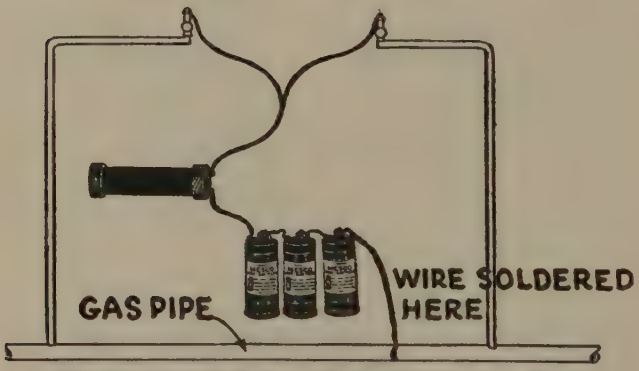


Fig. 36.—Wiring diagram for gas lighting spark coil.

when the circuit is broken. An 8-inch spark coil, meaning that it is 8 inches long, is large enough for all ordinary work, and a battery of three or four dry cells at least should be used.

To instal a gas lighting system unscrew the old burner from the gas fixture and screw on the electric burner. Set the battery and the spark coil in any convenient place and *ground* the carbon of the battery, that is, connect it to the gas pipe at any point. Connect the zinc of the battery to one of the binding

posts of the spark coil, run a wire from the other binding post of the coil to the insulated contact of the burner, or to as many burners as you have, all of which is shown in the wiring diagram in Fig. 36; the gas pipe itself completes the return circuit as it is directly connected with the movable contact of the burner. The wires leading from the fixed contact

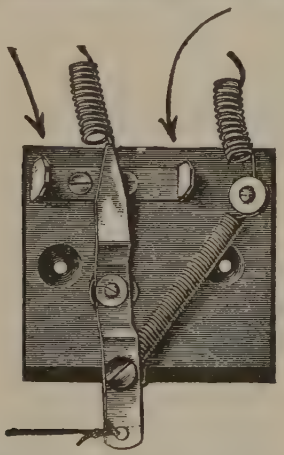


Fig. 37.—A burglar alarm trap.

wire can be run along the pipes so that they are hardly noticeable.

How to Instal a Burglar Alarm Trap.—There are forty different kinds of *burglar alarm traps* to catch the forty thieves, but all of them work on the contact principle.

A simple and effective burglar alarm trap is shown in Fig. 37; it costs $1.50 and it works like this: When the trap is screwed to the wall as close to the

place where the protection is wanted as may be convenient and the thread which is fastened to the contact lever is attached by the other end to a window, a

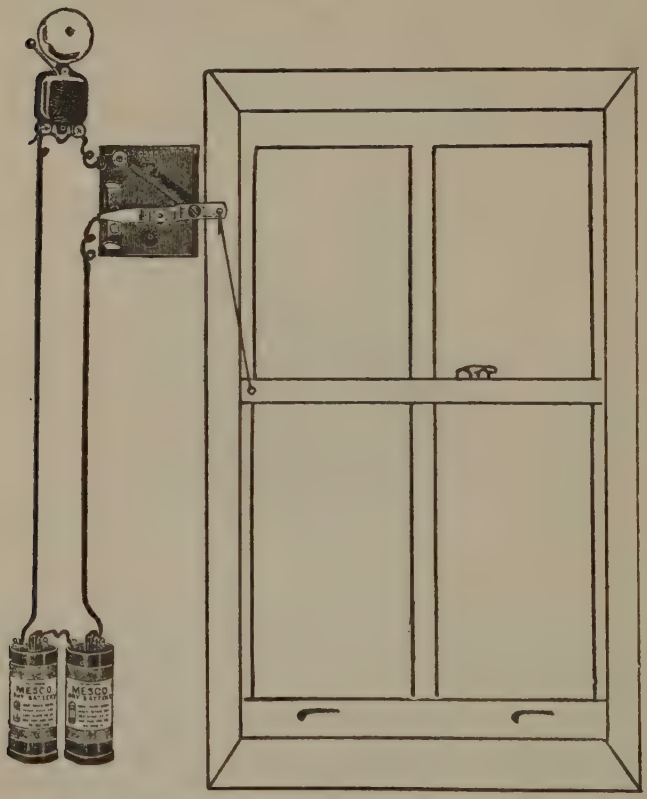


Fig. 38.—Wiring diagram for a burglar alarm trap.

window shade, transom, door, or is stretched across a room or hallway, the slightest pull or pressure on

the string will move the needle to the right and this closes the circuit.

Or if an intruder runs against the thread, or cuts it, a spring pulls the needle to the left and this completes the circuit, and so you catch your burglar either going or coming. This trap will also act as a fire-alarm if the string should be burned away. A couple of dry cells and a good loud-ringing bell complete the outfit. It is wired up as shown in Fig. 38.

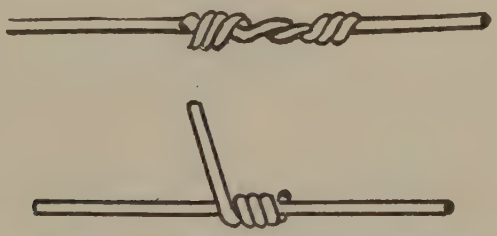


FIG. 39.—A. A wire splice. B. A wire joint.

How to Solder and Tape Wires.—At least a good half of all the troubles with apparatus using battery current can be traced to badly made joints and splices.

The first thing to do in making a joint or a splice is to skin the insulation off of the wires with your knife and then scrape them clean with the *back* of the blade. If a splice is to be made cross the wires 1 inch from the ends and twist the end of each wire around the other wire as shown at A in Fig. 39.

To make a joint wrap the end of the branch wire

around the main wire as shown at B in Fig. 39, using your pliers to tighten up the turns of the wire.

While joints and splices for battery circuits are seldom soldered it is always the surer way to solder them. If the wires are hanging free you can direct

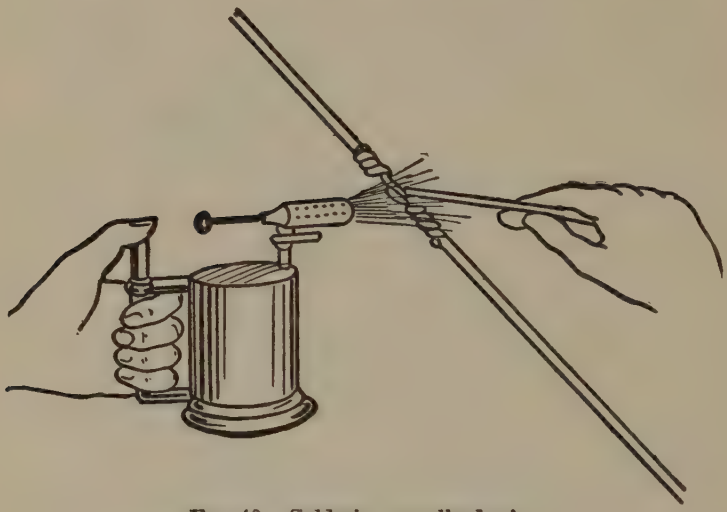


FIG. 40.—Soldering a spliced wire.

the flames of your blow-torch directly on the joint, and after putting on a little flux touch it with the end of your wire-solder as shown in Fig. 40; but if the wires are close to a wall you must use your soldering copper to do the job with.

Always use your soldering paste for the flux in soldering wires, as the acid solution will rot the insulation. When annunciator wire is used wrap the

joints and splices with a single layer of *electrician's tape* (15c. for ¼ lb. roll). Where electric light wires are spliced tape them first with *rubber tape,* or *splicing compound,* and then cover the rubber tape with electrician's tape, or *friction tape,* as it is called.

Replacing Fuses.—Where the electric light service wires run into a house, and at different junctions of branch circuits, you will find an iron box, and in it

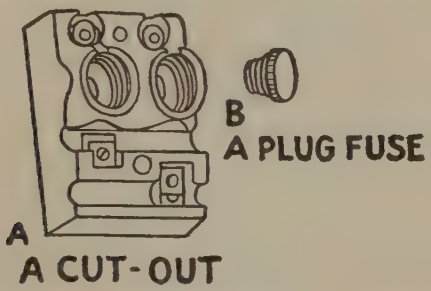


Fig. 41.—A. A cut-out block. B. A plug fuse.

there is one, or more, *porcelain blocks* called *cut-outs.*

These cut-outs usually have screw holes, or *sockets,* as they are called, in them, as shown at A in Fig. 41. The kind of fuses that are made to fit these sockets are called *plug fuses,* see B Fig. 41, and these are screwed into the sockets of the cut-out like an incandescent lamp screws into a lamp socket.

Before attempting to take out or put in a plug fuse throw off the main switch; the safest way to do this is to tie a stout cord to the handle and then you can pull it down without touching it when you throw

it off and use a stick to push it back when you throw it on. And always stand on a dry board to do it.

When a single light goes out it stands to reason that the lamp has burned out. When two or more lamps go out at the same time it is a foregone conclusion that a plug fuse in one of the branch cut-out boxes has blown.

Should all of the lights in the house go out simultaneously you will know that the fuses in the main cut-out box have blown. For a house of ordinary size 10 ampere fuse plugs are about the right size for the branch cut-outs.

Coloring and Frosting Electric Light Bulbs.—The bulbs of incandescent lamps can be given any color by cleaning them in warm soap suds, rinsing in clear water, drying with a cloth, polishing with tissue paper and then dipping them into the following solutions:

First beat the white of an egg to a froth and thoroughly mix it with 1 part of rainwater and filter, and be sure there are no bubbles on the surface of the solution. Tie a string around the plug end of each lamp, dip it in the solution and hang it up to dry; after drying thoroughly dip it a second time and let it dry again.

Next make a solution by dissolving 20 grains of *soluble aniline dye,* which can be had in any color, in 4 ounces of *collodion.* Dip each bulb in the solution, hang it up and let it dry over night. Dip the bulbs again and again, letting them dry thoroughly

each time until the color is deep enough to suit your aesthetic taste.

Frosting Bulbs.—Dip the bulb in a solution made by dissolving as much alum in the water as it will take up. By adding cochineal for red, turmeric for yellow, and indigo for blue to the solution frosted bulbs in these colors may be made.

Testing and Fixing Electric Heating Apparatus.—Should an electric iron or other piece of electrical heating apparatus fail in its action test out the connecting cord first, as the fault is usually to be found in either it or the socket ends.

To test it simply connect the plug end with a battery and bell and short circuit the socket terminals with a piece of wire. Very often the screws in the plug end work loose, and if this is the case loop the ends of the wires around their respective screws and tighten up the latter.

Sometimes the wires of the connecting cord break at the socket, although the spiral coil of wire outside of the cord is put on for the express purpose of preventing this from occurring. In any event the iron or other apparatus will more than likely work all right if the cord and plug and socket are in good condition.

If not, then take the iron apart, examine the *heating element,* which is a piece of flat resistance wire, and see if it is burnt out. If this is the case order another heating element from your dealer in electrical supplies or from the maker of the iron.

CHAPTER V

THE AMATEUR PLUMBER

Stopping Leaks in Lead Pipes.—The best way to stop a leak in a lead pipe is to either solder it or to make a new joint entirely.

But as an emergency makeshift a leak can be quickly stopped by making a tapering wooden plug, say half an inch long, cover it with a single thickness of muslin, smear it with *red-lead putty* and then drive it gently into the hole.

Wrap the pipe with electrician's *friction tape* to keep the plug from coming out. *Red-lead putty* can be made by mixing red-lead with linseed oil to the consistency of dough.

Soldering Lead Pipes.—Since it is next to impossible to solder a lead pipe when there is water in it the latter should be let out first. Next scrape the lead around the hole clean and bright; use a large soldering copper, have it very hot, but never red-hot, use *resin* as a soldering flux and regular *plumber's solder*. This can be bought at any hardware store, or you can make it yourself by melting 1 part of tin with 1 part of lead.

How to Make a Cup-Joint.—Whenever you find it necessary to join two pieces of lead pipe you can

do it easily and make a fairly good job of it by means of a *cup-joint.*

The first thing to do in making a cup-joint is to saw off the ends of the pipe where the union is to be made, nice and smooth; then taper off the lower end

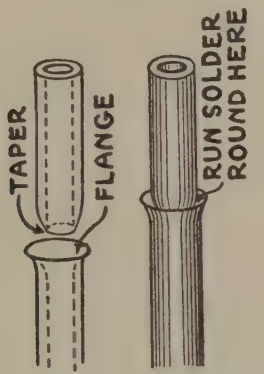


Fig. 42.—How a cup joint is made.

of the upper pipe with a *rasp,* that is, a rough cut file in which each tooth is single pointed and is separate from the other.

The upper end of the lower pipe must be cut away on the inside to form a cup into which the tapered end of the upper pipe sets as shown in Fig. 42. Scrape both of the connecting ends bright and clean, put some powdered resin round the flange and run some solder round the joint with your soldering copper.

How to Clean Out Pipes.—Drain pipes of all

kinds around the house get clogged up every once in a while for any one of a number of reasons. If the water will not run out of a sink unscrew the cap at the bottom of the S trap as shown in Fig. 43, when the dirt or other obstruction can be removed.

A long piece of electric light wire with the insulation on it, or a piece of telegraph wire is very effective in cleaning out a straight or a bent pipe if



FIG. 43.—A lead pipe S trap.

there are no sharp turns in it, for all that is needed is to run the wire back and forth several times through it, when the obstruction can generally be broken up and dislodged.

Putting New Washers in Faucets.—When the water cannot be turned entirely off by a *faucet,* or *bib-cock,* as a faucet with its nozzle pointing downward is often called, the trouble can be remedied by putting in a new washer.

To do this unscrew the brass *nipple* of the faucet with your monkey wrench and unscrew the *valve-stem,* which can then be taken out.

On the lower end of the stem you will see a rub-

ber, or a leather washer, or *gasket,* or what there is left of it; remove the machine screw, replace the worn out washer with a new one. Put the machine screw back into place, screw in the valve stem, screw on the nipple and it will work as well as it ever did.

How to Prevent Water Pipes from Freezing.—Where the water pipes are inside the house there is little danger of them freezing, but if for any reason you think they should be protected it is a good scheme to cover them with an *asbestos* and *hair pipe covering.* This comes in sectional form 3 feet long and split open on one side so that it can readily be placed around the pipe.

If the line of pipe is particularly exposed where it will be subjected to the same temperature as it would be out-of-doors, use two layers of the asbestos and hair covering, that is, one layer over the other so as to break all longitudinal and abutting joints. *Zero* pipe covering is a good kind to buy, and the present list price is about 17 cents per running foot for the 1-inch pipe size, and 22 cents for the 2-inch size. It is sold by H. W. Johns-Manville Co., Madison Avenue and 41st Street, New York.

When Leaving a House in Winter.—Before leaving a house in or for the winter open all of the faucets and cocks and let all of the water in the pipes run out, as well as the water in the *flush tank* of the closet outfit.

Open the *cover* in the bottom of each trap, the function of which is to shut out the foul air of the house

drains from the rooms, and let the water out of these, and finally the water in the trap of the bowl of the closet outfit can be taken out without removing the stool by using a large sponge.

Take all of these precautions on going away in the winter and then when you return you will be saved a lot of work and worry. Be sure and have the covers of the traps screwed on tight before the water system is used again.

How to Thaw Out Frozen Water Pipes.—If the pipe is exposed wrap the place where you think it is frozen with woolen cloths and pour hot water on it until it thaws out. Should the pipe be an underground one the only thing you can do is to dig down until you reach it and then give it the hot water treatment.

Of course if there is no object in sparing the pocket you can perform the operation with an electric pipe thawing outfit. Where your water supply is taken from the street mains and the intake pipe freezes telephone the *Water Company* or the *Water Department* if the utility is owned by the City, and they will thaw it out by electricity, for most of them have outfits for this express purpose. At any rate it is their business and not yours.

A Handy Clean-Out Plunger.—This is a very simple kind of a force-pump; it is formed of a hardwood handle about 3 feet long to which a rubber cup, or plunger is attached, as shown in Fig. 44. It is a very useful device for forcing stoppages in waste and

drain pipes, especially the traps of the bowls of closet outfits. It costs about 50 cents.

The Mechanism of a Flushing Tank and How to Keep It in Order.—A closet outfit consists of two parts and these are (1) the tank and (2) the bowl. The mechanism of the tank is shown in Fig. 45 and the details of the supply valve and flush valve



Fig. 44.—A handy clean-out plunger.

at A and B in Fig. 46. Now beginning with the water supply when the tank is full of water the hollow copper ball floats on top and the supply valve A is closed and of course no more water can run into the tank from the supply pipe.

When the chain is pulled the flush valve B is opened and the water rushes down the flush pipe. The copper float falls with the water and this opens the valve of the supply pipe and the tank begins to

refill. When the float has again risen to its top level it closes the supply valve and no more water can flow into the tank unless the supply valve leaks.

To prevent the tank from running over, the flush valve is fitted with an overflow pipe as shown at B,

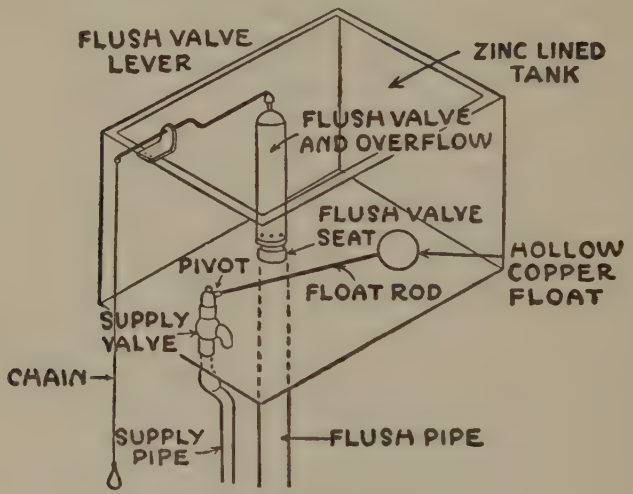


Fig. 45.—The supply tank.

which also shows the flush-valve when taken out of the valve seat. The supply valve is shown in cross section at A. If the valve is faulty then it will let a certain amount of water flow all the time into the tank, and this not only wastes the water but it makes an unnecessary noise.

To fix it unscrew the float rod and take the plunger out of the supply cock and you will most likely find

that the rubber washer, or gasket, shown at A, has worn out. Replace it with a new one and it will work O. K.

Another and worse trouble is when the tank keeps filling and emptying automatically and making a noise that is very disheartening. In this case the

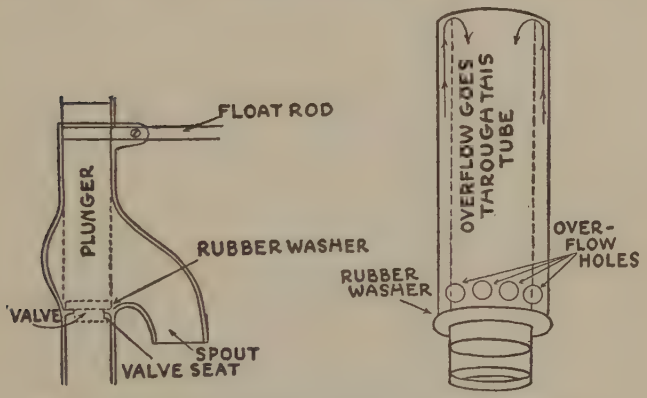


FIG. 46.—A. Cross section of supply valve. B. Cross section of flush valve.

rubber ring, or washer on the flush valve, see B, is probably at fault and needs renewing.

The construction of the bowl is shown in Fig. 47. Should the trap in the bowl get clogged up a piece of copper wire with a hook on the end can be forced into it from above and the obstruction removed, or, what is better, a *clean-out plunger* can be used.

Pumps, How They Work and How to Fix Them.—*Pitcher Spout Pump.*—This is a pump that

is largely used in kitchens where the cistern is near by and where there is no regular plumbing system. A pump of the kind, see A, Fig. 48, can also be

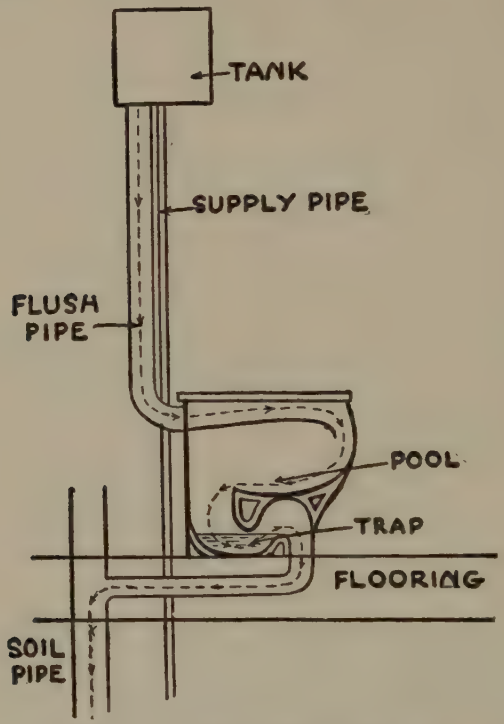


FIG. 47.—A cross section of the bowl.

used for wells that are not over 20 feet deep. It is very simple in construction and a small one can be bought for a dollar or so.

As B in Fig. 48 shows, it consists of a barrel or

cylinder, a piston rod and piston head, a piston valve and a barrel or cylinder valve, and in action it works like this: When the piston is raised up it exhausts some of the air from the pipe, whose lower end dips into the water in the cistern, through the valve, and this carries the air into the barrel of the pump because of the pressure of the air on the water in the cistern.

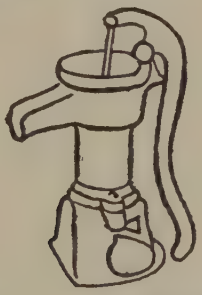


FIG. 48.—A. A pitcher spout pump.

On the down stroke the cylinder valve closes again and the piston valve is pushed up, thus giving the air that is in the barrel a chance to escape up through it. This action is continued until all of the air in the pipe has been pumped out, and then of course the water is forced up and the piston works on it just the same as it did with the air.

When a lift pump has to be *primed* each time just before pumping or when it gets so that it won't lift the water at all you can take it for granted that the leather washer on the piston head, or simply *leather,*

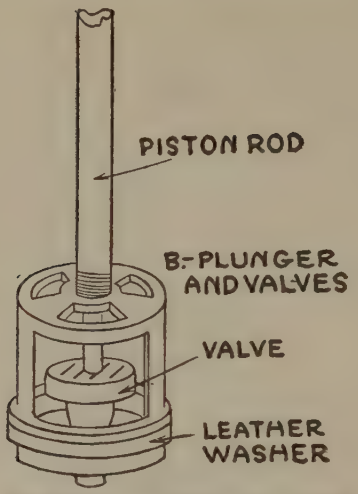


FIG. 48.—B. Plunger and valves.

as it is called for short, does not fit the barrel perfectly, and consequently there is a leakage of the air. To fix it scribe a circle $\frac{1}{16}$ inch larger in diameter

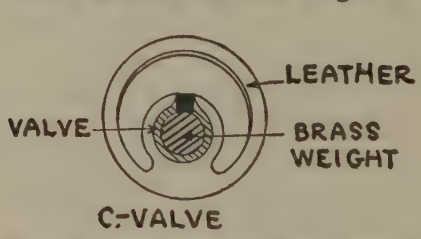


Fig. 48.—C. Top view of foot valve for simple lift pump.

than the diameter of the barrel, on a piece of leather $\frac{1}{4}$ inch thick and scribe another circle $1\frac{1}{2}$ inches in

diameter inside the larger one; cut out a washer and soak it in linseed oil for 24 hours, when it can be fitted on the piston and the trouble will end. Plunger leathers can be bought already cut out for about 5 cents each.

The pump valve is made of brass; this and the *seat* are *ground* to make them fit air tight; the oxide accumulating on these valves can be cleaned off by using fine emery paper, and finally be sure the joint where the supply pipe is connected with the pump is tight or this will also let the air leak out. The piston valve is shown at B in Fig. 48 and the barrel valve at C.

Double Acting Force Pumps.—Nearly all pumps which are made to supply storage tanks in attics or other elevated places in order that a constant flow of water may be had in the bath room and kitchen are of the double-barreled type, as shown at A and B in Fig. 49. A pump of this kind is merely a lift pump like the pitcher spout pump, except that it has two cylinders, and these empty into an inclosed part of the pump, which in turn is connected with the pipe that leads to the tank.

This kind of a pump, shown in cross section at B, Fig. 49, also has a valve in the pipe which supplies the tank to keep the water that has been forced into it from running back into the pump between strokes, and after you have stopped pumping. The piston leathers are about the only things that wear out, though the leather check valve in the tank supply

pipe may need to be replaced. A new valve can be made by cutting one out of $\frac{1}{8}$-inch thick sole leather, using the old valve as a pattern.

It is often hard to start the water to flow if the pump is an old one. When this happens unscrew the

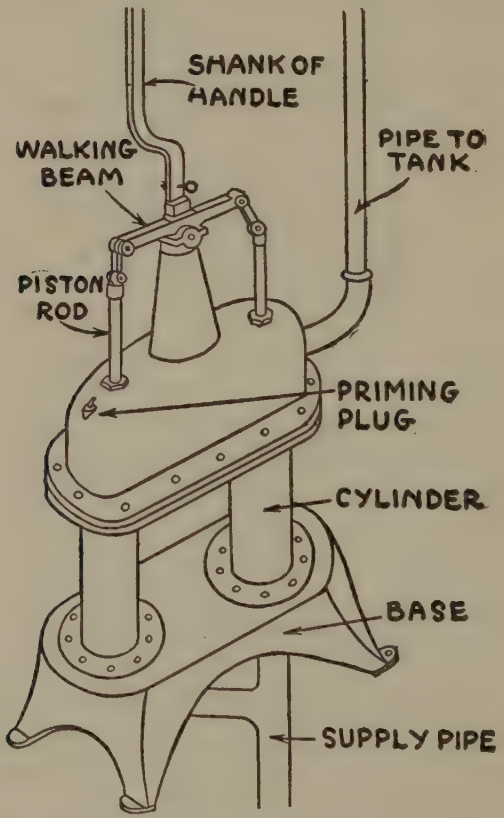


FIG. 49.—A. A double acting force pump.

priming plug and pour a quart of water into the barrel through the hole; this will make the piston leathers fit the cylinders air tight when the pump will again do its work.

How to Clean a Gas Jet.—When particles of dust get into a gas jet the flame burns uneven, smokes

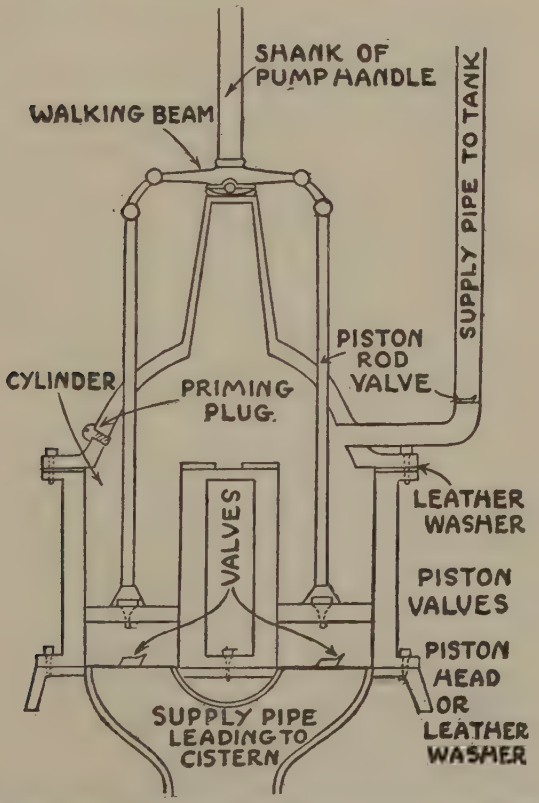


Fig. 49.—B. Cross section of a double acting force pump.

and the light is poor. To make a cleaner cut out of thin sheet brass, or tin will do, a strip ½ an inch wide and 2 inches long. Bend over one edge ⅛ inch and then again ⅛ inch, making the cleaner ¼ inch wide, and the folded back will give it the stiffness it needs. To clean the jet simply run the sharp edge of the cleaner through the slot of the tip and it will remove all the little particles that clog it up.

How to Detect Gas Leaks.—The odor of the gas is usually the first indication that there is a leak, and there are a couple of ways by which the exact place of the leak can be found.

The first and safest is to put a drop or two of soapsuds on the suspected spot when, if you have guessed right, a little bubble will be formed. The second and easiest way is to run a lighted match all around the pipe when the gas will ignite and so show where the leak is. *Never use a match if the odor of gas is very strong.*

Keeping Gas Cooking Stoves in Order.—There are several little things that the *chef de cuisine,* or just plain cook, as we call Oscar here at home, ought to know about using gas stoves and which if he, or she, does not know, or knowing does not heed, will soon make the stove cut up capers, and as the handy person around the house you will quickly be called into consultation.

Like the gas-fitter's helper, look wise and inform him, her or it, as one who speaks by the card, that the water, or coffee, or soup must not be allowed to

boil over and run into the burners; that the burners should be taken out at least once a month, and oftener if necessary, turned upside down and the soot tapped gently out of them; that they should then be washed in clean soap-suds and thoroughly dried, and that when these instructions are adhered to there will be no reason for bothering you.

CHAPTER VI

THE HANDY GLAZIER

About Window Glass.—There are two grades of window glass and these are called (1) *single thick* or *single strength,* and (2) *double thick* or *double strength.* Single thick glass is about $\frac{1}{12}$ of an inch thick and double thick glass is about $\frac{1}{8}$ of an inch thick. The thickness of window glass varies somewhat, but it is graded by the makers to conform to this standard as nearly as possible.

Tools Used for Cutting Window Glass.—There are two kinds of tools used for cutting window glass, and these are (1) *steel cutters* and (2) *diamond cutters.* A steel cutter is good enough for all ordinary purposes but to cut plate glass a diamond cutter must be used.

Steel cutters are fitted with either a hardened steel point in the end or else a steel wheel, which is better, and cutters of this kind can be bought for as little as 25 cents. A steel wheel cutter is shown at A in Fig. 50. A diamond glass cutter has a chip of genuine diamond mounted in a swivel end, and it is a pleasure to cut glass with one of these. It is shown at B in Fig. 50, and it costs about $4.50.

Sizes and Prices of Window Glass

Size.	Single Thick Per Light.	Double Thick Per Light.	No. of Lights in a Box.	Size.	Single Thick Per Light.	Double Thick Per Light.	No. of Lights in a Box.
7x 9	$0.04	$0.05	114	20x22	$0.40	$0.49	16
8x10	.05	.07	90	20x24	.43	.52	15
8x12	.06	.09	75	20x26	.46	.56	13
8x14	.07	.10	64	20x28	.50	.60	13
9x12	.07	.09	67	20x30	.54	.65	12
9x14	.08	.12	57	20x32	.60	.73	11
10x12	.07	.10	60	20x34	.60	.73	11
10x14	.09	.12	51	20x36	.43	.52	10
10x16	.10	.15	45	22x24	.46	.55	14
10x18	.12	.17	40	22x26	.50	.60	13
10x20	.13	.19	36	22x28	.54	.65	12
10x22	.15	.20	33	22x30	.60	.73	11
10x24	.16	.22	30	22x32	.67	.81	10
10x26	.21	.25	23	24x24	.54	.65	12
10x28	.22	.27	26	24x26	.54	.65	12
10x30	.24	.29	24	24x28	.60	.73	11
10x32	.28	.34	23	24x30	.67	.81	10
12x14	.11	.18	43	24x32	.78	.91	9
12x16	.12	.19	38	24x34	.78	.91	9
12x18	.16	.22	33	24x36	.88	1.02	8
12x20	.18	.25	30	24x38	.95	1.09	8
12x22	.19	.23	27	24x40	.95	1.09	8
12x24	.22	.27	25	26x26	.60	.73	11
12x26	.25	.30	23	26x28	.78	.91	10
12x28	.28	.33	21	26x30	.78	.91	9
12x30	.32	.39	20	26x32	.95	1.05	9
12x32	.34	.41	19	26x34	.95	1.09	8
12x34	.37	.43	18	26x36	.78	.91	8
12x36	.38	.46	17	28x28	.78	.91	9
12x40	.44	.54	15	28x30	.95	1.09	9
14x16	.14	.21	32	28x32	.95	1.09	8
14x18	.16	.22	29	28x34	1.08	1.15	8
14x20	.17	.24	26	28x36	1.08	1.15	7
14x22	.20	.29	23	28x38	1.27	1.46	7
14x24	.22	.32	21	28x40	.95	1.09	6
14x26	.29	.43	20	30x30	.95	1.09	8
14x28	.36	.44	18	30x32	1.09	1.25	8
14x30	.38	.46	17	30x34	1.09	1.25	7
14x32	.40	.49	16	30x36	1.27	1.46	7
14x34	.43	.52	15	30x38	1.27	1.46	6
14x36	.46	.56	14	30x40	1.76	1.91	6
14x40	.51	.62	13	30x44	1.09	1.25	5
16x20	.20	.29	23	32x32		1.25	7
16x22	.23	.33	20	32x34		1.46	7
16x24	.24	.35	19	32x36		1.59	6
16x26	.38	.46	17	32x40		1.91	6
16x28	.40	.49	16	32x42		1.91	5
16x30	.43	.52	15	32x44		1.91	5
16x32	.46	.56	14	36x38		1.91	5
16x34	.50	.60	13	36x40		1.91	5
16x36	.51	.62	13	40x40		1.44	5
16x44	.70	.82	10	40x42		1.44	4
18x20	.29	.41	20	40x44		2.59	4
18x22	.36	.44	18	40x46		2.59	4
18x24	.38	.46	17	40x48		2.85	4
18x26	.43	.52	15	42x48		2.85	4
18x28	.46	.56	14	44x44		2.85	4
18x30	.50	.60	13	44x46		2.85	4
18x32	.50	.60	13	44x48		3.85	3
18x34	.56	.67	12	44x50		3.85	3
18x36	.60	.73	11	46x48		3.85	3
20x20	.36	.44	18	48x48		4.48	3

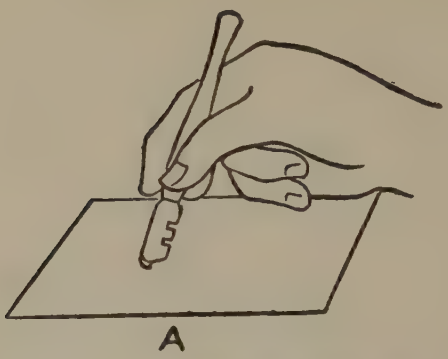


FIG. 50.—A. A steel wheel glass cutter.

How to Use a Steel Wheel Cutter.—The secret of using a steel wheel cutter is to dip the wheel into

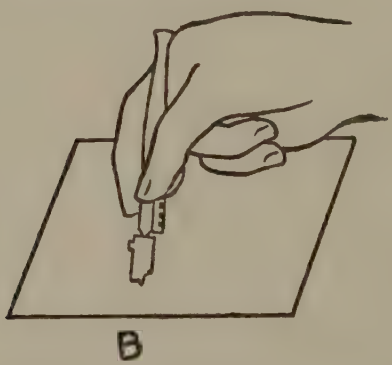


FIG. 50.—B. A diamond glass cutter.

kerosene before each cut is made, and when this is done it is surprising how well it will cut. A handy

way to do this is to keep a wide-mouthed bottle of kerosene ready for use.

How to Use a Diamond Cutter.—Hold the handle at the lower end, which is three-sided, between your thumb, index and medius fingers—one on each side—as shown at B in Fig. 50, but closer to the swivel joint; press firmly and draw it along the straight edge on the glass firmly and evenly.

It requires some skill to use a diamond cutter properly, and for this reason it is best to practice on some small pieces before attempting to cut a light of any size.

How to Cut Window Glass.—*With a Pattern.*—Lay a large sheet of paper on your table or bench and mark the size of the glass you want to cut on it. Lay the glass over the sheet of paper and a *straight edge,* that is the edge of a rule, a T square or anything that has a true edge, nearly on the mark and run your glass cutter along the latter and over the glass. This is an easy and sure way where only an occasional light is needed.

Another way is to lay the glass flat on your bench and place a T square with the arm on one edge of the glass as shown at A in Fig. 51; now measure off the width or length whichever you are cutting, slide the blade of the T square along until the edge coincides with the mark on your rule and then hold it down firmly. Start your glass cutter from the side of the glass that is away from you and draw it toward you with a firm pressure and an even stroke.

After the cut has been made if it does not readily break, tap it gently with the handle of a screwdriver. All glass cutters have notched shanks, the purpose of which is to enable you to slip it over the edge of the glass when a little pressure will break the glass at the cut.

How to Make a Cutting Board.—Where any considerable number of lights are to be cut as in

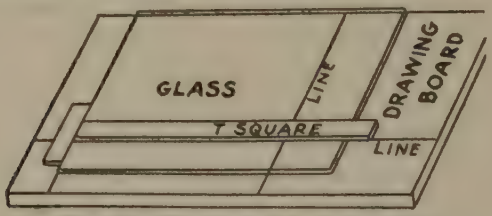


FIG. 51.—How to cut a window light.

making hotbed sashes for a green house, a cutting board is a very convenient accessory.

To make a glass cutting board get a drawing board of any size and screw a strip of wood to one end as shown in Fig. 52. Take two ten cent tape measures such as dressmakers use and glue these along the sides of the board so that the figures begin at the strip and be sure to have the numbers of both tape measures even. With this board you can cut glass to any size easily, quickly and accurately.

Removing Old Putty from Sash.—The usual way to remove old putty is to use a knife, and sometimes a hammer is needed where the putty is very hard.

Another way, and this is easier though it takes longer, is to make a paste of 1 ounce of soft soap, 1 ounce of pearl-ash to which a little powdered lime has been added, and mix with 4 ounces of fuller's earth. Smear this mixture over the putty and let it remain over night, when the putty will be more

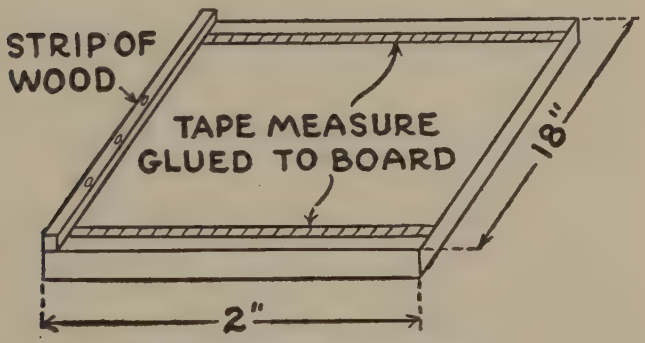


Fig. 52.—A glass cutting board.

or less soft. After removing the putty wash the *bed* of the sash frame, as the part is called against which the glass rests, with soap and water.

How to Make Glazing Putty.—To make glazing putty mix one-half or a pound of *whiting,* which is pulverized chalk, with enough raw linseed oil to make a stiff dough, leave it over night and then knead it again and pound it with a mallet. To make it keep better add about 5 per cent of cotton-seed oil.

To make a putty that dries harder than the one just described use $\frac{1}{3}$ of a pound of white lead and $\frac{2}{3}$

pound of whiting and mix these together before adding the oil.

How to Put in a Light.—After having taken out the old glass, removed all the hard putty and washed the bed of the sash frame, cut the light to fit and clean it. Next spread some putty thinly along the bed on which the light is to rest—hence this part of the job is called *bedding* the light—set it in and press it firmly against the putty.

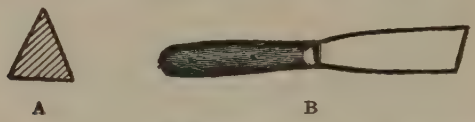


FIG. 53.—A. A glazier's point. B. A putty knife.

This done, drive eight or more *glazier's points,* little three-cornered bits of zinc as shown at A in Fig. 53, into the frame to hold the light in place. A quarter of a pound of these points can be bought for 10 cents or less. Take a dab of putty, roll it into a thin strip and lay it around the edge of light and the frame.

Use a *putty knife,* as shown at B in Fig. 53, to press the putty into place and to smooth it off. Put on enough putty so that the top of the zinc points do not show. With very little practice you can work the putty into a smooth layer and make neat looking square corners.

To Clean Windows.—While you may not consider cleaning windows as one of your jobs, still if

you have to do it, it is just as well to do it right.

First whittle a stick to a sharp point and clean out the dust and dirt that have hardened in the corners of the sash; second wash the windows with clean water in which you have poured a little *concentrated liquid ammonia,* and third wipe the windows dry with a clean cloth.

If you want to do an extra good job, make a thin paste by mixing some whiting with alcohol. Rub this paste on the glass, let it dry, and then rub it off with a clean cloth and it will take on a polish that will rival the colored boy with the black face and shiny eye.

CHAPTER VII

THE FURNITURE REPAIRER

Easing Doors and Drawers That Stick.—The doors of a bookcase, china-closet or sideboard and the drawers of a sideboard, dresser or chiffonier often get so that they stick when you try to open or close them.

This untoward condition is caused (1) by the piece of furniture not setting level and (2) by the wood swelling in damp weather. Before ever planing the door or drawer try this expedient first.

Cut out two wedges of wood 1 inch thick at the large end, 1 inch wide and 6 inches long and drive these under the different castors in turn thus raising the corners. Very often it will be found that a door or a drawer that has stuck before will, when the piece of furniture is raised on one corner a little, swing open and shut or slide out or in with as much freedom as when it was bought.

A harder thing to remedy is the sticking caused by damp weather. Sometimes a door or a drawer can be made to work by rubbing *French chalk* on the places where it strikes the frame. If this does not do the business, then you can use your smooth plane if you do it very carefully, because if you

take off too much when the wood dries out there will be a gap when the door closes or a rattle if it is a drawer.

Re-Seating Chairs.—Cane chairs and lots of other kinds are thrown away after the seats are worn out, but this is certainly a poor way to practice economy around the house.

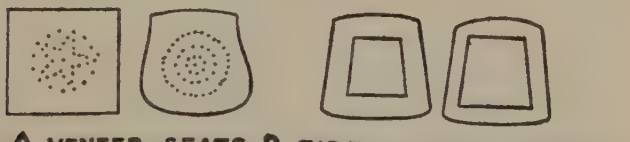




FIG. 54.—Ready made chair seats.

The honest way is to re-seat the chairs and this can be done in three shakes of a dead lamb's tail by removing whatever kind of a seat the chair has and then putting on a *veneer* or *fiber board* or an *upholstered seat,* any one of which can be bought at prices ranging from 10 cents up to 75 cents each.

Three-ply veneer seats are built up of three pieces of stock to prevent them from warping and these can be bought in various colors, see A Fig. 54. The fiber board seats, see B Fig. 54, can be had

in various sizes, shapes and styles. They are nicely embossed in various designs and look and wear almost as well as leather. The veneer or the fiber board seats can be nailed in place with either round headed brass tacks or enameled upholsterer's tacks.

A removable ready made chair seat, see C Fig. 54, is built up of veneer stock and then covered with imitation black leather over elastic cotton. There are four hooks on the bottom of the seat to fasten it to the chair.

Repairing Broken Chairs.—Cheaply made chairs go to pieces usually for the want of a little



FIG. 55.—A. Repairing a chair round.

glue. Whenever a round or any part of a chair works loose don't wait for the rest of it to follow suit; but glue it in at once or the chair will surely go to pieces like the one-horse shay.

If a round breaks off close to the leg, cut the round off smooth and make a piece of wood to build it up to its original length; drill a $\frac{1}{4}$-inch hole $1\frac{1}{2}$ inches in the round and clear through the piece; smear some glue on the abutting ends of the sticks and drive a $\frac{1}{4}$ inch brass or iron rod through the piece and into the end, as shown at A in Fig. 55, and saw off the end of the rod with your hack saw. Now bore out the broken off piece in the leg and glue in the

round. To tighten up the legs while the glue is drying loop a piece of strong cord around the legs just

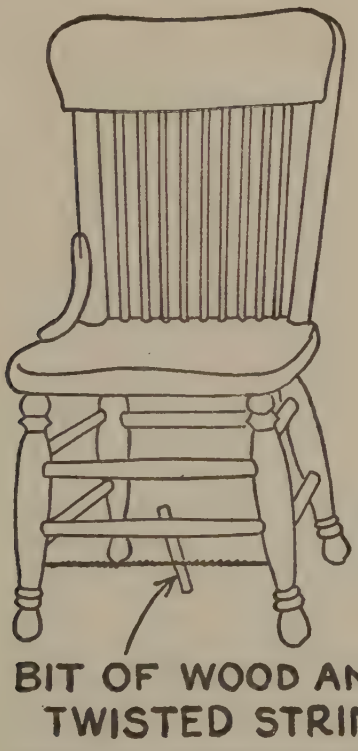


Fig. 55.—B. Tightening up the legs.

below the round as shown at B in Fig. 55, and tighten it up by twisting the cord with a stick.

Arms of chairs that are broken can be fixed in much the same manner I have just described, that is

by smoothing off the broken part, boring out the hole in the abutting part and setting in a metal or wooden dowel pin.

Castors That Won't Fall Out.—It is very annoying to have castors that persist in dropping out every time the corner of a bed, a table or a dresser is raised.

You can put a castor in tight by slipping in two or three strips of sheet lead about $\frac{1}{16}$ inch thick, $\frac{1}{4}$ inch wide and as long as the stem of the castor and then driving the latter gently in. Don't strike the wheel with a hammer or even a mallet, but hold a cold chisel on the plate of the castor and strike the head of the chisel.

Castors having what is called a *grip-neck* can be bought for as little as 10 cents a set and once in they will not drop out.

Tightening Dresser and Sideboard Handles.—Knobs and handles are always coming loose and without a handy person and the right kind of tools they are seldom fixed.

The reason handles and knobs get loose and come off is because the nuts on them are not tight enough to begin with. The constant pulling on the handles soon wears off the threads on the shank and on the nuts and then it is impossible to screw the latter on.

Now right here is where your set of taps and dies comes in, for you can cut new threads on the shanks and by using new nuts they will be as good or better than when they were put on in Grand Rapids.

Another little trick is to slip on a *lock washer* before you put on the nut and then the handle will never work loose again.

Taking Dents Out of Furniture.—If the dent or bruise is a small, shallow one it can generally be taken out by the following simple process: Put a few drops of warm water on it, then hold a very hot soldering copper as closely to it as you can without actually touching it, but *do not* hold the hot copper over it after the water has evaporated. Repeat the operation until the bruise or dent disappears.

Larger bruises and dents, if they are not too deep, can be removed by soaking a piece of clean blotting paper folded over several times in warm water; then lay it on the offending spot and place a hot flat iron on it to drive off the water. Repeat until the surface is level. For deep dents, cracks, etc., a *filler* is the only remedy.

A good filler for this purpose can be made by melting 1 ounce of white resin and 1 ounce of yellow wax in a pan, adding enough ocher, which can be had in various colors, to give it the color of the wood. Stir well and fill in while hot. This filler not only sticks firmly to the wood, but dries very hard.

To Prevent Hinges from Creaking.—Small hinges can be lubricated with machine oil, but oil is too light for door hinges; either lubricate the hinge with soap, or with graphite or better make a

paste of soap, lard and graphite and rub it in well.

How to Clean Furniture.—When the new finish of furniture has lost its luster it can be renovated by washing it with a sponge wet in clean, cold water and wiping it as dry as possible with a piece of chamois skin.

As fast as the chamois skin takes up the water, squeeze it out and keep on with the work. Never use a dry chamois on furniture and always rub it in the same direction, as cross or circular rubbing will leave marks.

To remove white spots that sometimes appear on varnished furniture rub the surface with a soft, woolen cloth saturated with a few drops of linseed oil mixed with an equal amount of turpentine. When the spots have been rubbed away wipe the oil off dry with another soft clean cloth.

A Good Furniture Varnish.—A good light varnish can be made by dissolving 2 ounces of white shellac in ½ a pint of alcohol; strain it through a piece of fine cotton muslin, or some cheese cloth, and then add another ½ pint of alcohol. If you want a dark colored varnish use orange brown shellac instead of the white. Keep the varnish in a wide-mouthed bottle well corked to prevent it from evaporating. A pint can of good furniture varnish can be bought ready made for 25 or 35 cents according to quality.

The varnish should be applied to furniture with a regular varnish brush made of black Chinese

bristles and preferably one having a *chisel edge*. A varnish brush of this kind 2 inches wide costs 30 or 40 cents. When through using a varnish brush wash it out in alcohol and hang it up so that it will be in good form for the next time.

A Good Furniture and Piano Polish.—A dandy all-round polish can be easily made by dissolving 1½ ounces of white shellac in ¼ pint of naphtha; strain each one separately and then put them in a bottle and mix well.

To use the polish make a pad by folding over a soft piece of flannel and pour on enough polish so that it is saturated with it; then cover the flannel with a bit of fine, soft linen, put on a drop or two of linseed oil and rub the surface over lightly with a circular motion. Finally finish the job by rubbing off with a soft pad on which you have put a few drops of naphtha.

A Fine Polish for Leather.—Dissolve enough beeswax in turpentine until it is about as thick as the cream you get if you live in New York, that is thin cream, and you will have a polish for leather upholstered furniture that can't be beaten.

How to Re-Upholster Furniture.—Usually the first thing that wears out on an upholstered chair is the covering of the seat.

If the chair has been a cheap one to begin with, the covering of both the seat and the back is generally made of a very poor quality of brocaded silk and it is not long before it begins to look shabby.

To re-upholster almost any kind of a piece of furniture is a very simple matter and one that you should delight in doing. The first step is to buy the piece of material you are to use for the covering, and often you can get beautiful remnants of brocaded velour, embossed plush, or tapestry large enough to cover a seat or a back very cheaply.

Then you will want some *gimp,* that is, the kind of binding upholsterers use, ⅜ inch wide to match the color of the covering you intend to use, and some *gimp tacks,* or sharp-pointed tacks about ⅜ inch long and having a small round head made especially for this kind of work.

Take off the old gimp from the chair first and draw out all the tacks, being very careful not to mar the finish on the chair. After the gimp is off you will find that the covering is tacked down and this must also be removed but do not disturb the cotton filling. In all ordinary upholstered chairs there is a depression around the inside edge of the seat or back of the frame and this makes it easy to cut the covering to just fit this space.

If you are using a covering of cheap tapestry or any kind of cotton goods, dampen it after you have cut it the right size and shape, tack it around the edge with some gimp tacks, and stretch it as you put it on. The purpose of dampening the covering is so that it will be perfectly tight when it dries.

When this is done you can tack on the gimp; begin at one of the front corners and drive in the

tacks about 1½ inches apart and along the outside edge rather than in the middle. Use your nail set to drive the tacks home. When you come to a corner don't cut the gimp, but fold it over until it just fits and then tack it down. After you have the gimp on all around and are back to the corner where you started from, fold under the edge of the gimp and tack it down smooth.

All kinds of upholsterer's supplies can be bought of dealers in furniture and the coverings can be bought at dry-goods stores.

CHAPTER VIII

THE HOME DECORATOR

About Wall Paper.—Wall paper is usually sold on the basis of a *single roll,* that is, a strip 16 inches wide and 8 yards long, but as there is twice this length of paper on each roll as it comes from the manufacturer, it is called a *double roll* and of course you pay twice as much for it as the price quoted for a single roll.

Wall paper is especially designed for the kind of room whose walls are to be covered. *Embossed* and *oatmeal* papers are the proper thing at this writing for parlors, libraries and dining rooms, and floral and striped papers are nice for bed rooms. The ceilings of these rooms can be *kalsomined* or they can be papered with what is called *independent ceiling* paper, that is, a paper different from that used on the walls, while *varnished tile paper* is good for the kitchen, bath room and wherever else a sanitary paper is needed.

When making your selection of wall paper it is well to bear in mind that a light shade of paper should be used where the rooms are dark and that darker shades of paper may be used to advantage for rooms that are light.

The Amount of Paper Required.—The first thing to do before buying your paper is to find out how many rolls you will need.

If you are going to paper the ceilings and side walls of a room, measure the width of the ceiling and divide this measurement by 18, since this is the width of a roll, and this will give you the number of cuts of paper to be used on the ceiling.

Now for a ceiling 8 to 11 feet long you should allow *four* cuts to a double roll; for a ceiling 11 to 14 feet long allow *three* cuts to a double roll, and for a ceiling 14 to 20 feet allow only *two* cuts. Suppose your ceiling is 7 feet 6 inches wide and between 8 and 11 feet long. Dividing 18 into 7 feet 6 inches (or 90 inches), you will have 5 as a quotient, in which case you will need *five* strips or cuts; and since you can only get four cuts out of a double roll if the ceiling is from 8 to 11 feet, you should get one double roll and a single roll to boot.

The side walls are measured for paper much in the same way as the ceiling. Find the total length of the room, that is, the lengths of the four walls added together, and divide by 18 to find the number of cuts needed. For a 7 foot 6 inch high wall you can get six cuts from a double roll; for an 8 to 9 foot wall you can allow five cuts to the double roll, and for a wall over 9 feet high allow only four cuts to the double roll.

Should you want to paper a room 9 feet square

and whose side walls are about 7 feet 6 inches high, the measurement of the four walls is 4 by 9, or 36 feet. Now changing this to inches, you will have 432 inches and this divided by 18 gives 24 cuts as a quotient. Hence for a room 9 feet square and about 7 feet 6 inches high you will need 24 cuts, and since you can only get six cuts from a double roll to be used on a wall 7 feet 6 inches high, you will of course need four double rolls to paper the room.

The Tools and Apparatus You Need.—Like every other trade, you must have the right tools if you are to do a creditable job. The first tool needed is a pair of *paper-hanger's shears* (75 cents) 10, 12 or 14 inches long, to trim the paper with.

Next you will need a *paste brush* and this should be about 7 or 8 inches wide and set with Russia hard bristles; and when buying any kind of a brush be sure that the center is set with bristles and not merely with a piece of wood. A good paste brush costs not less than $1.50 and on up to $5.00.

A *smoothing brush* is better than a smoothing roller; get one 10 to 12 inches wide at a cost of from 75 cents to $1.00. A *seam roller* is also a necessary tool and one with a slightly rounded maple face can be bought for 20 cents or so. A good *scraping knife* with a 4-inch steel blade can be had for half a dollar. All of these tools are shown in Fig. 56.

Last of all, but by no means the least, are the

accessories. These consist of a galvanized iron pail for the paste; two planed and trued boards 10 inches wide and 6 or 7 feet long for a pasting table, and a plank about 2 inches thick, 8 inches wide and 3 feet shorter than the room. You can either make or borrow some horses to stand the plank on, or better,

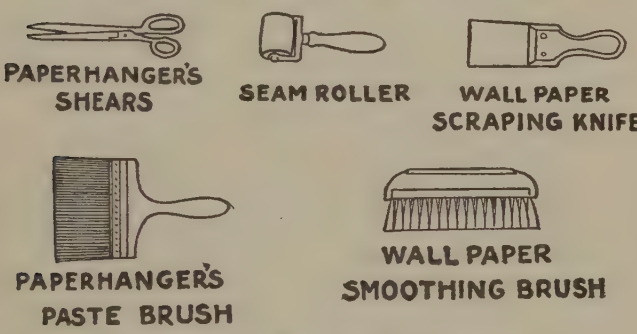


FIG. 56.—Tools needed for paper hanging.

use two step ladders. A fine pasting table can be made of two ordinary flour barrels with a 20 inch strip of wood nailed across the top of each.

How to Prepare the Walls.—Having the paper, tools and accessories, you are ready to begin operations. Move all of the furniture out of the room that you can, and the pieces that you can't move out cover with some old sheets. Take up the carpet, and if it is your first job it is just as well to spread some old newspapers around on the floor, that is, if it is a finished floor.

Now take your paste brush and with some clear,

cold water soak the paper on the wall as far as you can reach, standing in one place on the plank. After a few minutes take your scraping knife and scrape a small spot; if it scrapes easily, you have soaked the old paper enough, but if it scrapes hard, or there is more than one thickness of paper on the wall, you should wet the paper as many times as there are thicknesses. The main thing to do, however, is to give the water plenty of time to soak in before scraping.

Should there be any holes or cracks in the wall *point* them up; a good way to do this is to fill an old pan about half full of *plaster-of-paris* and then fill the pan up with water, letting it soak until it has taken up all the water, or until it stops bubbling. If any water is left, pour it off. After it has settled use from one side of the pan only, being careful not to mix it. In this way you can use plaster-of-paris for 30 minutes or more without its hardening. Use a wide scraper to put the plaster-of-paris in the cracks.

How to Size the Walls.—The next thing to do is to make and apply a mixture, or *sizing,* as it is called. To 3 pints of cold water mix half a pound of *ground glue* and let it soak for half an hour, stirring occasionally; then add 6 quarts of boiling water, let it cool for a short while and apply with a brush. This makes enough sizing for an average room.

How to Make the Paste.—When the sizing is

dry you should then make your paste for the paper. A good paste can be made by mixing 2½ pounds of wheat-flour with enough cold water to make a thick batter, and then thinning it down with more water to the consistency of flap-jacks. Pour on boiling water, stirring it until it becomes thick, and add a handful of granulated alum. Let it cool before using, and if possible make it the night before.

How to Paste the Paper.—Having measured the exact length of your ceiling, the next step is to cut and paste your paper. Cut the roll of paper into the required lengths, adding 9 inches to each end of each strip so that it will hang down the side walls. In this way you will have allowed plenty of paper for matching the pattern. Although this way is a trifle wasteful, it saves much time and labor which you would spend in matching beforehand.

Having cut the strips, take one and lay it so that the top of the paper is at the right end of the table as you stand facing it. Now starting at the right-hand end, paste about two-thirds of the strip and then fold over the right end so that the pasted sides are together and the top of the strip comes exactly to where you have left off pasting. Next paste the left end and fold it over until it meets the right and be sure to get the edges of the paper exactly even.

How to Trim the Paper.—After you have pasted and folded the strip of paper, it is ready to

be trimmed, and it should never be trimmed before. Take your shears and cut off the blank, or *selvage,* edge of the strip which is away from you.

How to Paper the Ceiling.—In order to get the first strip of paper on straight draw a chalk line on the ceiling 17 inches from the walls; take the pasted strip, stand on the raised plank and open up the long fold; taking the long end of the strip in the right hand and guiding it with the left, paste the selvage edge of the paper on the line from right to left.

After it is started use the smoothing brush to *sweep* it on with and shift it if the selvage edge does not butt the line exactly. To hang the next strip reverse the operation, that is, take the end of the strip in your left hand, turn your back to the strip already on and work the strip on the ceiling from right to left. Follow this rule until the ceiling is finished. Of course, as you hang each strip, you must take care to match the pattern accurately and the extra 9 inches on each end of the strip will give you plenty of leeway to do so.

How to Paper the Walls.—When you come to the walls measure them from the ceiling to the top of the baseboard and cut the first strip off 6 inches longer than this measurement.

Now starting at the right of a door hang the first strip, taking pains to have it exactly straight up and down. Next take the roll and match the next strip before you cut it, to the one you have just hung

on the wall; then cut, paste, trim and hang it. In this way the matching can be easily figured out. If a border is to be used it is hung in the same manner as the paper, that is, working from the right around to the left. After you have made a seam it should be smoothed with a seam roller before it is dry.

A Few Helpful Hints.—In starting a side wall begin at a point where mis-matching will show the least. A good place to start is at the right of any large break in the wall, such as a door or a bay window.

It is necessary to size a new wall before hanging the paper. Sizing has two objects, and these are to make the paper stick tight to the wall and to make it easier to remove the paper when you want to.

For *lincrustas,* burlaps and pressed papers add about 1 tablespoonful of Venetian turpentine to the pail of paste. This can be bought at any drug store.

If a painted wall has a high gloss it must be *cut* before hanging the paper. To do this make a glue size of ½ pound of ground glue which you have soaked for half an hour and added 4 quarts of boiling water to it. It should then have 1½ pounds of plaster-of-paris stirred into it. This size is used while warm and it should be stirred often to keep the plaster-of-paris from settling, and apply it with a brush.

When a kalsomined wall is to be papered the kal-

somine should first be softened with a brush and then scraped and washed off with a sponge. Of course the wall should then be sized.

Where an old whitewashed wall is to be papered you should first scrape off the loose whitewash and then go over the wall with equal parts of cider vinegar and water. After drying it should be sized with glue size as before.

If the wall is damp, it should be lined with damp-proof lining paper.

Curing Damp Walls.—Where paper is to be hung or paint is to be put on a wall that has a tendency to hold moisture, the first thing to do is to prevent the moisture from coming through. This is done by hanging the wall with *lining paper* first, all joints being *butted,* not lapped.

Two kinds of lining paper are used, the kind depending on whether the wall is to be painted or papered. If painted, the lining paper is clean and white on both sides, but if papered, then the lining paper has one of its sides tar-faced. If the latter kind is used, the tar-faced side should be pasted on the wall and the clean side sized in the usual way. Only walls that show no signs of drying out need to be lined. This paper can be bought at any wall paper store.

How to Kalsomine a Ceiling.—Very few paper-hangers still use the old fashioned hand mixed kalsomine, and all the up-to-date ones use a hot water preparation, that is, a ready made kalsomine

which needs only the addition of hot water to prepare it for use.

A good kalsomine of this kind is sold under the trade name of *moresco;* it is made by Benjamin Moore, New York, and can be bought at paint stores generally. For a 12 foot square ceiling take about 8 pounds of white *moresco* and put it in a 10 quart pail, taking care to note how far up the sides of the pail the dry *moresco* comes.

Now stir in enough hot water to bring the moresco up to the same point after it is mixed. When buying colors for moresco get *moresco colors* and stir the coloring in while the moresco is hot. The moresco is then chilled by setting the bucket in a tub of cracked ice or very cold water until it is gelled, and then put on with a kalsomine brush.

Before kalsomining the ceiling you should go over it with a *size* made of equal parts of *white shellac* and *denatured* alcohol, that is, if the ceiling is stained; but if it is clean and has never been kalsomined before, size it with equal parts of *ceiling varnish* and benzine. Whichever you use, allow the size to dry six hours and then put on a thin coat of white lead and turpentine with a little liquid dryer in it.

How to Make Stenciled Decorations.—Where the side walls of a room are kalsomined, a very pretty effect can be obtained by making a border with a stencil.

A stencil is a piece of heavy oiled paper with

a design cut through it with interrupted lines, as shown at A in Fig. 57. *Oiled stencil paper* can be bought of the larger houses that deal in painters' supplies and you can draw your own designs and



FIG. 57.—A. Oiled paper stencil.

cut them out with the point of a sharp pocket knife, or you can buy the stencils ready made, in which case ask for *decorating stencils.*

To use a stencil get a stencil brush (25 cents),



FIG. 57.—B. A stencil brush.

see B, Fig. 57, and then mix a very little *moresco stenciling color* with hot water, but the coloring must not be too deep for too much contrast will spoil the artistic effect. Beautiful fresco colors in fawn,

leather brown, carmine and myrtle green are made especially for stenciling effects in dining rooms. Fig. 58 shows how a border is stenciled on.

Interior Varnishing.—The keynote of success in doing a good job of varnishing is to have the furni-



FIG. 58.—Stenciling on a border.

ture, floor, or whatever you intend to varnish perfectly clean and dry.

After the varnish has been put on, both light and air are necessary to make it dry and harden properly, but do not let the wind blow on the varnished surface. The best results are obtained when the air is dry and the temperature of the room is about 70 degrees Fahrenheit. Use plenty of varnish on your

brush and apply it with long even strokes, rubbing it the way of the grain.

Varnishing New Floors and Woodwork.—New floors should have all the cracks filled up with any good prepared *filler paste.* Boyle's is as good as any for this purpose. It should be mixed with turpentine and then do a strip say 2 feet wide and the length of the room first.

When the gloss has left the filler it should be rubbed across the grain with *excelsior,* and then another strip should be done and so on. The filler should be allowed to dry for 24 hours and a shellac varnish made of 1 pint of *orange shellac,* 1 pint of *white shellac* and 1 pint of *denatured alcohol* should be applied to the floor. After it has dried overnight give it a heavy coat of Valentine's *felspar varnish,* which you should use undiluted.

Varnishing Old Floors and Woodwork.—The right way to go about varnishing an old floor is to remove all of the old varnish first. The best way to do this is to use a *liquid paint and varnish remover,* such as the one sold under the trade name of *ad-el-ite.*

It can be applied with an old scrubbing brush and should be allowed to soak into the floor for 20 minutes, when it must be scraped clean with an old putty knife. If any of the varnish then remains, another application of the varnish remover should be given it and the floor scraped again.

After you have cleaned 3 or 4 feet of the floor,

fill the cracks with the filler and rub the space thoroughly with benzine put on with a flannel cloth. The floor is then done all over in this way and given a coat of the felspar varnish.

Interior Painting.—The chief thing to insure a good job of interior painting is to have the surface clean and free from smoke, dirt or grease, and all these foreign substances can be removed from the wood with turpentine put on with plenty of elbow grease and a flannel cloth. When it has been washed well it can be re-painted with whatever color you want to use. To make the surface look glossy you must mix the paint with oil, and to give it a dull or flat look you must thin it with turpentine.

Cleaning Painted Walls.—To clean a painted wall add four tablespoonfuls of any kind of soap-powder, *Gold-Dust* preferred, to one quart of boiling water and cool with two quarts of cold water. Apply it to the wall with a clean brush, letting it soak in for 5 or 10 minutes, but do not let it run on to a part already treated. Wash it off with warm water and let it dry.

To Remove Old Paint.—Old paint should be removed as described for removing varnish from floors with *ad-el-ite*. The surface should be washed with benzine after all the old paint has been removed.

Interior Enameling.—One of the easiest to put on and at the same time nicest finishes for certain kinds of furniture, interior woodwork, metal ceilings,

bathrooms, etc., is prepared liquid paint sold under the name of *enamel.* Liquid enamel can be bought in white and black and in many different tints, and when it is laid on and dries it leaves a hard smooth surface. It costs about 40 cents a pint.



FIG. 59.—Coating the paper with isinglas size.

How to Put on Stained Glass Paper.—Stained *glass paper,* as it is called, is a tough paper designed and printed to imitate stained glass and made translucent with oils. It gives quite a pleasing effect when used for transoms, sash doors, cozy corner and bathroom windows.

Stained glass paper is sold in sheets, or sections, $8\frac{1}{2}$ by $8\frac{1}{2}$ inches square; it takes two sheets to cover one square foot of glass and it costs 4 cents a sheet.

To put on stained glass paper coat the paper with *isinglass size*—a viscous solution used for fixing the



Fig. 60.—Putting the paper on the window.

paper to the glass, which the dealers sell with the paper—and cover the back of the paper thoroughly, using a varnish brush to put it on with, as shown in Fig. 59. Now put the paper on the glass as shown in Fig. 60, and smooth it out with a *celluloid scraper,* that is, a stiff piece of celluloid about 2

inches long which is set in a wood handle, in order to remove the air and excess size.

In putting on the paper fix the corners first and the borders next; lap the black edges of the paper so that they will be of the same width. Then apply the sheet as shown in the illustration and rub it down with the celluloid scraper. Be sure the air is thoroughly rubbed out and the paper smooth on the glass. Go ahead until you have covered your window. To clean your hands when applying paper use a cloth saturated with kerosene.

Another kind of stained glass paper is called *vitrophane* and this is sold in rolls 18 inches wide and 13½ feet long and in half rolls 6¾ feet long. It costs 60 cents per roll and is easily applied.

CHAPTER IX

HANDY HELPS FOR THE HOUSE

How to Make a Self-Drying Soap Stand.—A self-drying soap stand can be easily made of a block of soft wood 1 inch thick, $3\frac{1}{2}$ inches wide and 4 inches long. Put the block in a vise and saw off

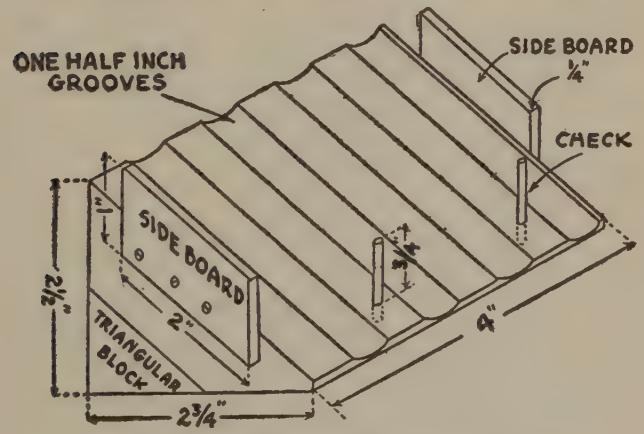


Fig. 61.—A self-drying soap stand.

the ends as shown in Fig. 61, and plane it smooth.

Cut four grooves with your half-round gouge on the face of the block, leaving about $\frac{1}{2}$ an inch between the grooves. Screw two triangular blocks to

the under side of the grooved board and screw two pieces of wood $\frac{1}{4}$ inch thick, 1 inch wide and 2 inches long to the ends of the board.

Next drill two $\frac{1}{4}$-inch holes in the block half an inch from the bottom; cut out two round plugs, or

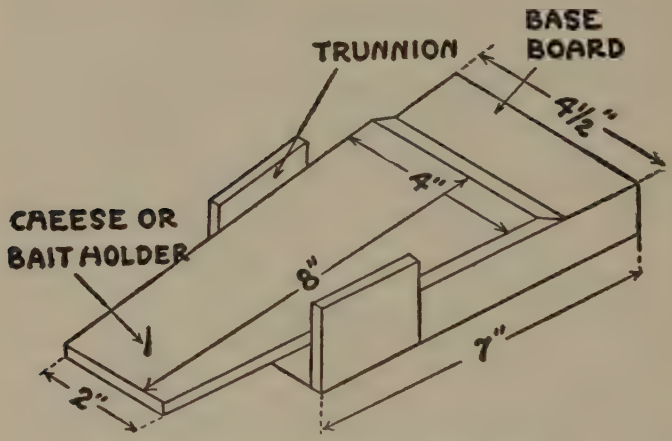


Fig. 62.—A. A self-setting mouse trap.

cheeks, 1 inch long and set them into the holes and the stand is done. The soap when placed in this stand will not get soggy and, different from a soap dish, the water drains off of its own accord.

How to Make a Self-Setting Mouse Trap.—Most traps in the market are made to sell rather than to catch mice with. This one works the other way about and besides it is very simple and self-setting.

Take a cigar box and cut out a tapering board 2

inches wide at one end, 4 inches wide at the other end and 8 inches long. Cut out two pieces of wood 1 inch wide and 2 inches long and screw them to the ends of a base-board made of pine 1 inch thick, $2\frac{1}{4}$ inches wide and 7 inches long. Drill a $\frac{1}{16}$ inch hole in the middle of each of the side blocks, put the tapering board between the blocks and put in

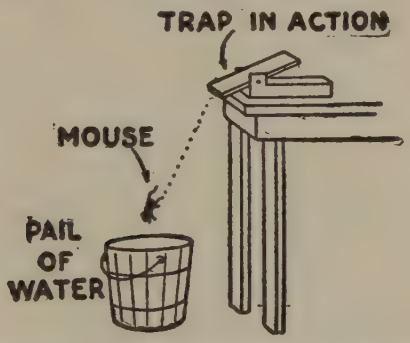


Fig. 62.—B. The mouse had a right to live.

a thin screw so that the board will be pivoted and free to move.

Drive a brad into the small end of the board to hold the bait and then you are ready for Mr. and Mrs. Mouse and all the little *mouses,* as Fig. 62 shows. Set the trap on the edge of a table or other convenient place, directly over a bucket of water. When the mouse walks on to the movable board after the cheese it tips out from under him and he drops into the water. Since the wide end of the board is heavier than the narrow end, the instant the mouse

has walked the plank the trap resets itself and is ready for another victim. A larger size can be used with equal advantage for trapping rats.

How to Make an Adjustable Book Rack.—Saw out of ½ inch thick hard wood stuff of any kind two blocks 4 inches wide and 5 inches long and round off one end as shown at A in Fig. 63.

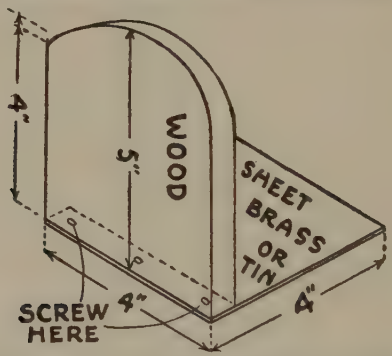


FIG. 63.—A. An adjustable book block.

Cut out two pieces of sheet brass or heavy sheet tin, 4 inches on the side, and drill three holes along one edge. Screw each piece of brass or tin to the bottom of each block. Screw each piece to the bottom of one of the blocks with ½-inch flat-headed wood screws and drive them in so that the heads will be flush—that is, even—with the under side of the sheet of metal.

Cover the bottom of each piece of sheet brass, or tin, by gluing on a piece of woolen or other soft cloth, the purpose of which is to keep the metal from

marring the varnished surface of the table. When finished the rack will look like B in Fig. 63. By placing two or three books on each end of the rack any number of books can be set in between and all of them will be held firmly in place.

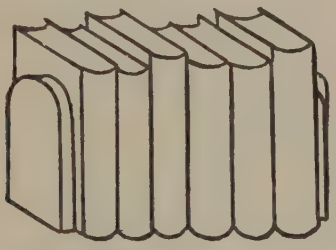


FIG. 63.—B. The book blocks in use.

How to Make a Quick Ice Cream Freezer.—This is an ice cream freezer made on a new principle, for the ice is put on the inside of the can and the cream is poured on the outside.

To make this freezer get a stout quart tin can and make a cover to fit it tight enough to keep it from leaking. Find the exact center of the bottom of the can and the cover with your dividers and make a dent in each of them with your center punch; now drill a $\frac{1}{4}$-inch hole through each one, take an iron rod $\frac{1}{4}$ inch in diameter and about 7 inches longer than the can and brighten it with a file at the place where it is to be soldered to the bottom.

Bend the end of the rod to make a crank as shown at A in Fig. 64. Slip the can with the cover on it over

the straight end of the rod so that the bottom of the can will be next to the crank and solder it to the

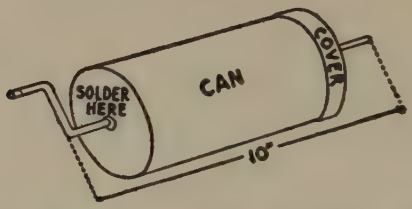


FIG. 64.—The can of a quick ice cream freezer.

rod one inch from the latter. This fixes the can to the rod and leaves the cover free to be put on

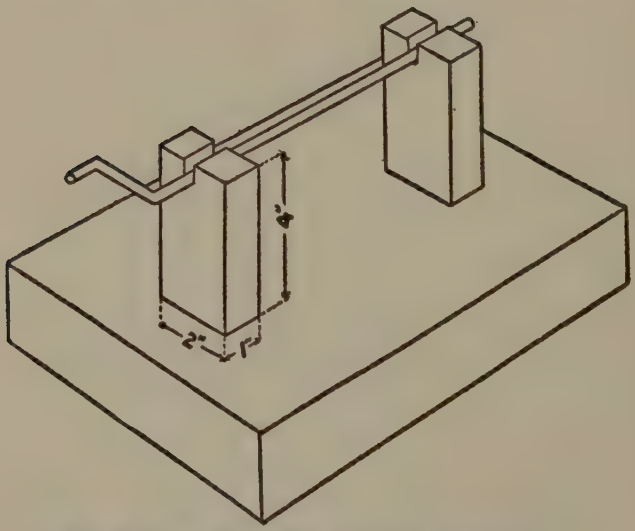


FIG. 65.—The stand of a quick ice cream freezer.

and taken off of the rod which is to form the spindle.

For the bearings cut out two blocks of wood 1 inch thick, 2 inches wide and 4 inches high and notch the ends as shown at B in Fig. 65; screw these blocks to a board 1 inch thick, 8 inches wide and 12 inches long, which will serve as a base.

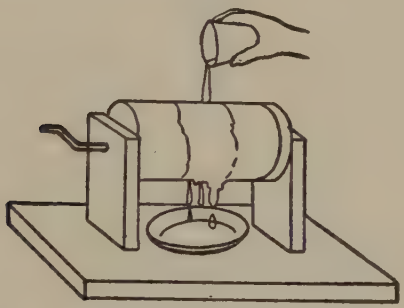


Fig. 66.—The ice cream freezer in use.

You are ready now to make some ice cream, which you proceed to do by *filling the can* with cracked ice and rock salt; then slip the cover over the rod, and put it tightly on the can and set this *revolving element* into the notches of the wood blocks, when the can can be turned very easily, as shown in Fig. 66.

The next move is to wipe the can off clean, then begin to turn it and pour your ice cream mixture in a thin stream very slowly on the *outside of the can,* when it will freeze there and it will be no time until you have enough of the frozen stuff to make

a dish, when it can be scraped from the can. Try it and be happy.

How to Make a Shower Bath While You Wait.—By a shower bath while you wait I mean one that can be rigged up in five minutes. All you need for this improvised bit of civilization is a dou-



FIG. 67.—A. An improvised shower bath.

ble pulley wheel, a couple of lengths of clothesline, a screw hook and a sprinkling can.

Thread the ropes through the blocks of the pulley over the wheels, screw the iron hooks into the ceiling and slip the ring of the pulley over the hook.

Fill a sprinkling can with water, tie one end of the long rope to the bail of the can and tie one

end of the short rope to the handle of the can. Hoist the can above your head and over the tub, if you are taking your shower in a room, and tie the other



FIG. 67.—B. He would fain be clean.

end of the long rope to a cleat which you have previously screwed to the wall.

Now by pulling down on the free end of the short rope you will have a most delightful bath ranging all the way from a gentle shower to a cloudburst,

depending on how hard you pull the rope. The whole scheme is shown in Fig. 67.

How to Make a Window Ventilator.—It is as necessary for your skin to breath pure air as it is

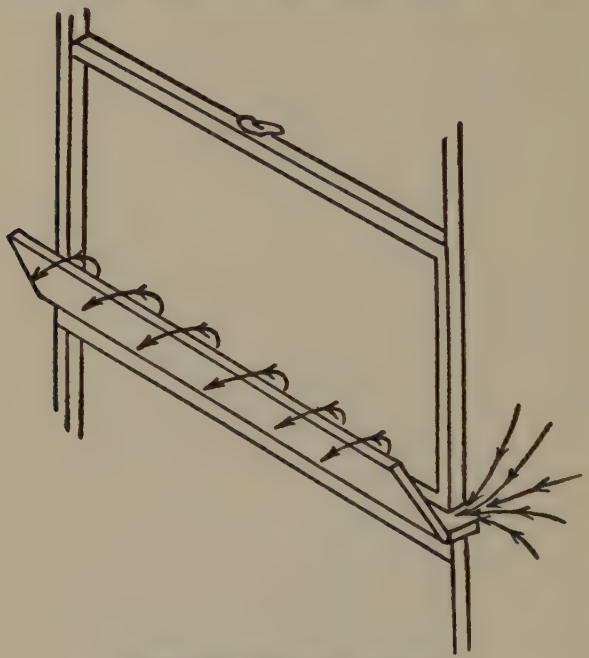


FIG. 68.—A window ventilator.

to be saturated with heat, but it is uncomfortable, if not indeed dangerous, to sit in a draft in winter especially, but this is just what happens if you are near a raised window.

A good and cheaply made ventilator is shown in

Fig. 68. Make a frame as long as the window sash is wide so that it has two sides, each of which is 4 inches wide, and fasten them together with a block 4 inches square screwed on at each end. In the picture the ends are not shown so that the direction of the flow of the air currents through the ventilator may be followed.

Take a board 6 inches wide and as long as the frame and bevel off one edge and then screw it to the lower strip of the ventilator frame, when it should set at an angle of about 30 degrees. To relieve the strain on the board, wires can be fastened to the top of the latter and run down and fixed to the upper strip of the frame. Cut out two triangular end pieces and screw these to the ends of the beveled board.

To place it in position raise the window, set the box on the sill, pull the window down on it and you will have a constant supply of fresh air without any short cut drafts.

How to Make a Window Cupboard.—This is a contrivance that you ought to make, for it will greatly add to the facilities of the kitchen. It is a ventilated cupboard that sets outside the window and in which meats, vegetables, and other edibles can be kept sweet and clean.

Build up a frame-work as large as the lower half of the window where the cupboard is to be used as shown in Fig. 69, and then saw off and plane smooth enough laths to make slated blinds just like window

shutters. In fact if you can get hold of a pair of old shutters you can saw them in two in the middle, and these will make admirable slatted sides for the frame.

A solid bottom made of boards should now be nailed in the frame and a shelf should be put in



FIG. 69.—A window cupboard.

about half-way between the bottom and the top. The top should project a couple of inches all around the edges of the frame and slant down a little, and, finally, it should be covered with tin or roofing paper.

Before the shelf is fastened in cover the three sides with wire netting to keep out flies and other insects, and it is a good scheme to make a screen door for

the inside of the cupboard. Screw or nail the cupboard to the outside of the window and put a couple of angle braces under it to relieve the weight.

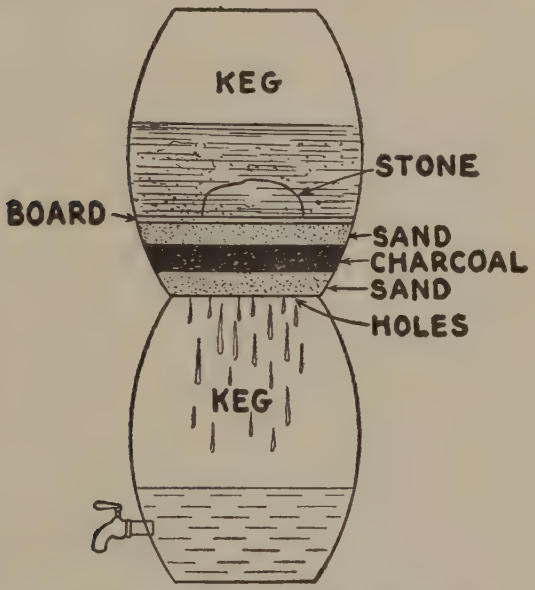


FIG. 70.—A cheap water cooler and filter.

How to Make a Cheap Water Filter and Cooler.—This filter will supply the family with drinking water as clear as *White Rock* and twice as natural as *Red Raven Splits.*

Get two small kegs and scald them out until they are perfectly clean; bore a hole in one of the kegs near the bottom and fit in a faucet. This keg forms

the cooler. Saw or cut out a hole 3 or 4 inches in diameter in the bottom of the other keg and place a saucer upside down over it.

Put in enough clean pebbles to form a layer on the bottom of the keg a couple of inches deep. On top of this put a layer of clean coarse sand 1 inch thick, then a layer of fine sand, then a layer of powdered charcoal, with the dust blown out of it, two inches thick, and on top of this put a layer of fine sand; finally lay a board over the sand to keep it in place when the water is poured in. A cross section view of the whole apparatus is shown in Fig. 70.

Water that is murky or discolored with iron after it has passed through this filter will come out as clear as though it had been distilled.

How to Make an Efficient Fire Extinguisher.—Get a sheet of heavy tin and cut out a piece $8\frac{1}{2}$ inches wide and $9\frac{1}{2}$ inches long, roll it into a tube 3 inches in diameter and solder the seam well.

Scribe the arc of a circle, the *radius* of which is 5 inches (since the diameter is 10 inches), and make the arc $8\frac{1}{4}$ inches long and then scribe a smaller arc $4\frac{1}{2}$ inches long inside the first arc as shown at A in Fig. 71.

Roll the piece of tin up in the form of a cone and make the large end $3\frac{1}{8}$ inches in diameter and the small end $\frac{3}{8}$ inch in diameter, solder the seam and then solder the cone to the end of the tube as shown at B in Fig. 71.

Cut out a circular block of wood $2\frac{7}{8}$ inches in di-

ameter and cut a groove all around its periphery with your gouge; wrap the groove with cord until it fits snugly into the tube, and yet so that it can be worked

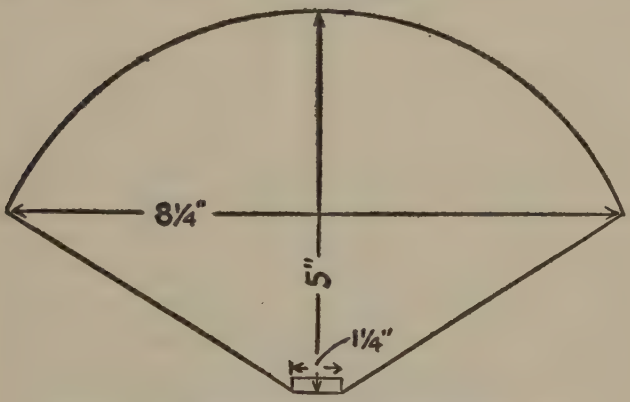


FIG. 71.—A. The tin cone for the end of the tube.

like a piston, and oil the cord well with machine oil. Cut out another circular block 3 inches in diameter and drill a ¼ inch hole in the center of both of the pieces of wood.



FIG. 71.—B. The fire extinguisher in use.

Cut a strip of hard wood 3 inches long and 1 inch square, plane off the sharp edges to make a handle, and bore a ¼-inch hole in its middle. Get an iron rod ¼ inch in diameter and 10 inches long, cut threads on

both ends and screw a nut on one of them. Slip the piston over one end and screw on another nut to hold it fast; slip the other wooden disk over the rod and then put on another nut; set on the handle and screw on another nut to keep it in place.

Cork up the small end of the squirt-gun and fill the tube with ammonia water made by mixing 5 parts of *copperas,* 20 parts of *ammonium sulphate* and 125 parts of water; when nearly full insert the piston and screw the wooden head to the barrel of the squirt-gun and your fire extinguisher is ready for use as shown at B in Fig. 71.

Now when fire breaks out pull the cork and by pushing the piston home, a stream of ammonia water will play upon the flames and soon put out the fire. This is a very efficient fire extinguisher and it is easier to use it than it is to get insurance afterward.

How to Make an Aquarium.—To make an aquarium is not a hard thing to do if you do it the right way. Get a piece of cypress if possible, or else oak will do, 1 inch thick, 18 inches wide and 5 feet 5 inches long. Saw off two end pieces 17 inches long and saw off the bottom which should be exactly 2 feet long.

Now a half-inch from each side of the end pieces cut a groove with your chisel ½ an inch deep and groove the bottom lengthwise along the edges the same way. Screw the two end boards to the ends of the bottom board with thin 1½ inch brass wood screws as shown in Fig. 72.

The next thing is to get two double thick sheets of clean window glass 17½ inches wide by 23 inches long for the front and back of the aquarium. Slide the

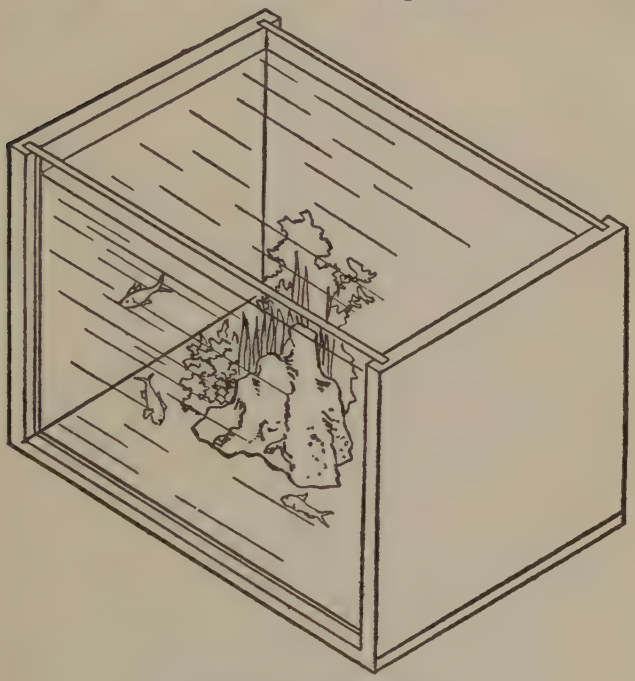


FIG. 72.—An aquarium.

panes into the grooves and see to it that they fit snugly. You are then ready to cement the glass in and make all the cracks water-tight.

To make the cement take 1 pound of resin and add ¼ pound of tar and ⅕ pound of linseed oil. Melt them together over a gentle fire and with this com-

pound fill all of the cracks. Run a stout piece of wire around the top of the aquarium to keep the water from springing the end boards apart, and after the cement has dried for 24 hours test the tanks for leaks. If none appear give the frame a coat of shellac varnish and paint it if you think it will improve its appearance.

When the paint is dry spread some white sand over the bottom, and rockwork—which fancy fish like —can be made by melting bottles in a hot fire. Add a few fresh water plants, and with your gold-fish and a few man-eating sharks your aquarium will be a joy for a long time to come.

How to Make a Sleeping Window.—One of the surest ways of gaining health is sleeping out-of-doors, but as conditions, especially in the city, often make this impossible, a sleeping window is the next best thing.

Make a frame according to the dimensions shown in Fig. 73. Use good clear hickory, oak or spruce 1 inch thick and 2 inches wide and screw the pieces together with brass wood screws. The braces are bolted to the frame with iron bolts $\frac{1}{4}$ inch in diameter, and through the outside ends of the braces $\frac{1}{4}$-inch holes are bored; a $\frac{1}{4}$-inch iron rod is slipped through the holes and nuts are screwed on. The whole frame is then painted green or with some other color of paint.

Tack a double piece of canvas with upholsterer's tacks over the bed of the frame, that is, its lower

part, and finally cover the whole frame with cotton mosquito netting or wire netting, which is better. As a precaution against bad weather a piece of wa-

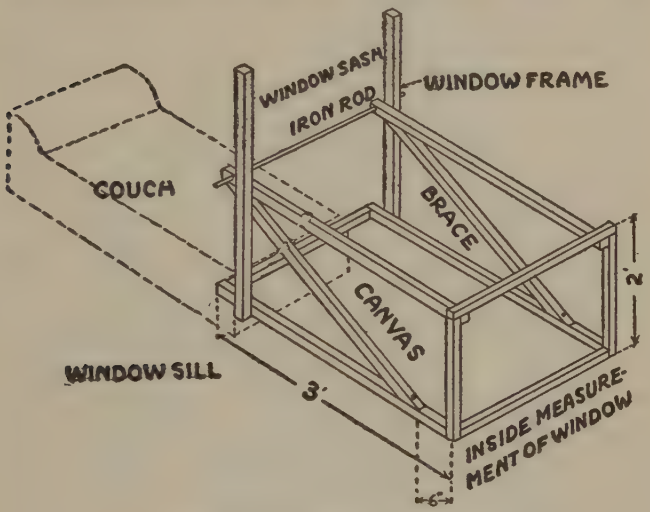


FIG. 73.—A sleeping window.

terproof canvas, rubber blanket, or oilcloth should be fixed to the upper frame so that it will cover it and the windy side and so make your sleeping window water tight.

How to Make a Folding Bath-Tub.—If you must have a tub when you take your *bawth,* here is one that like your bed you can take up and walk away with, and like your tent you can fold up and silently steal away with.

To make the tub you will need the following ma-

terial: Two strips of wood 3 by 3 inches square and 5 feet long for the top rails; two strips 2 by 2 inches square and 5½ feet long for the lower braces; four sticks 2 by 2 inches square, 2 feet 3 inches long for the legs; two cross sticks 1 inch thick, 2 inches wide and 20 inches long for the side braces; two bolts

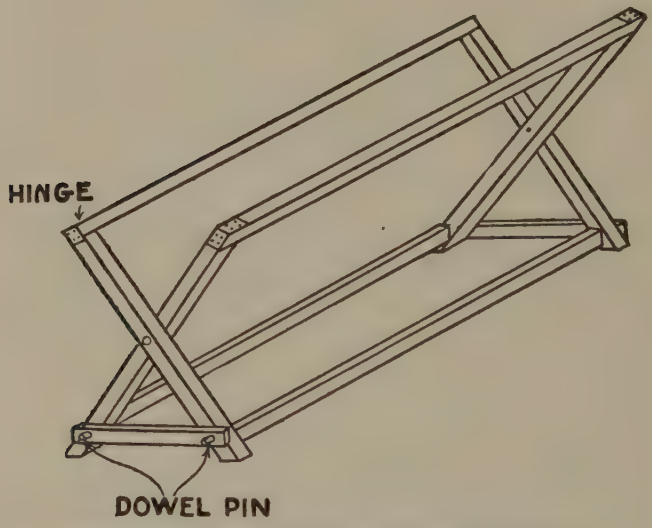


Fig. 74.—A. The frame of a folding bath-tub.

½ an inch in diameter and 5 inches long fitted with nuts and washers, and two wrought-iron *flap hinges.*

Begin by boring a ½-inch hole through the middle of each of the four sticks for the legs, bolting each pair of sticks together and bore a hole 2 inches from

the end of each leg. Spread the legs apart a distance of 2 feet and cut the ends off nearest the holes so that the legs will set flat on the floor as shown at A in Fig. 74. The tops of the legs must be sawed off square. These things done, screw the hinges to the squared ends of the legs and to the top rails.

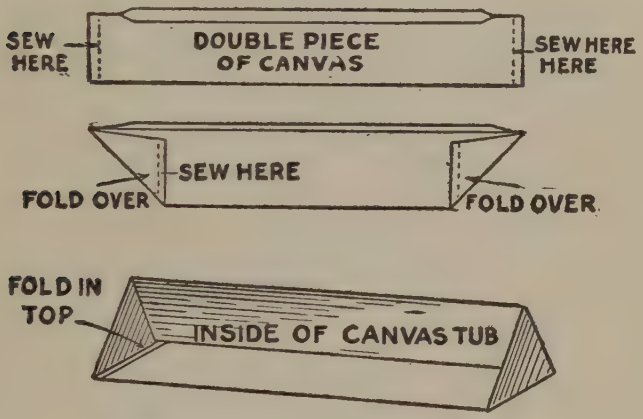


FIG. 74.—B. Making the canvas tub.

Cut the ends of the long 2 by 2 strips down to 1 inch in diameter and 4 inches back so that they will fit into the holes in the legs of the horses and project through 2 inches; next bore a 1 inch hole in the end of each of the cross sticks and slip the round ends of the long strips into these; and finally drill a $\frac{1}{8}$-inch hole through the round ends for a nail, or a *cotter-pin,* to hold the legs and cross sticks in place.

To make the tub get a piece of canvas 6 feet wide

and 9 feet long and waterproof it. This can be done by stretching the canvas on a frame, giving it several coats of boiled linseed oil mixed with a little dryer and set it in the sunshine to dry; it can then be given a coat of shellac varnish or painted white.

To shape the canvas into a tub double the canvas over lengthwise with the painted side in and sew up the ends of it; fold in each end 2 feet as shown at B in Fig. 74, and double over the top edge of each end to make it straight, when you will have a V-shaped tub. Now set it into the frame and tack the edges to the top rails with brass upholsterer's tacks, fill it with water and play you are a submersible.

CHAPTER X

ODDS AND ENDS

SHOP HELPS

How to Clean Files.—Never let your files get full of dirt or of the materials you are filing, for this prevents the teeth from cutting the work as they should and it makes them look as if they were worn out.

To clean files properly buy a *file card* for 10 cents and brush out the files after you have used them. Files are usually oily when you buy them, but you can remove it by filing a piece of charcoal with them and then brushing it out with the file card.

Watch and Machine Oils.—A suitable oil for clocks and other fine mechanism must be of such a nature that it does not harden, dry up or get thick when it is cold, and which does not readily oxidize.

To Make a Good Watch Oil.—(1) A little pure olive oil that has been filtered can be used without further preparation. (2) A better oil can be made by mixing 1 ounce of pure olive oil and 2 ounces of alcohol in a bottle, cork it and let it stand in a dark place for a couple of days.

Take a pound clean bottle and nearly fill it with distilled water, or filtered rain water will do, pour

the oil and alcohol mixture into it and shake it well for several minutes. Let it stand an hour and then freeze it, being careful that the bottle does not break, when a fine fluid oil will rise to the top. Siphon this off and you will have a genuinely good fluid oil.

Sewing Machine Oil.—Pure sperm oil alone is too heavy to make a good light machine oil. A good oil can be made by mixing 1 ounce of kerosene oil with 2 ounces of sperm oil. Filter and it is ready for use.

Common Steel Wire Nails.—The following table gives the size, the length in inches and the price per pound, though the latter is subject to change. The letter *d* stands for *penny,* as the old English scheme for sizes of nails is still in use.

Size.	Length, Inches.	Per Lb. Any Quantity.
2 d	1	3½c
3 d	1¼	
4 d	1½	
5 d	1¾	3c
6 d	2	
7 d	2¼	
8 d	2½	3c
9 d	2¾	
10 d	3	
12 d	3¼	
16 d	3½	
20 d	4	2½c
30 d	4½	
40 d	5	
50 d	5½	
60 d	6	

Iron and Brass Flat and Round Head Wood Screws.

Length	Number 1		2		3		4		5		6		7		8		9		10		12	
	Iron	Brass	Iron	Brass	Iron	Brass	Iron	Brass	Iron	Brass	Iron	Brass	Iron	Brass	Iron	Brass	Iron	Brass	Iron	Brass	Iron	Brass
Inches																						
1/4	.01	.02	.01	.02	.01	.02																
3/8	.01	.02	.01	.02	.01	.02	.01	.02														
1/2			.02	.02	.02	.02	.02	.02	.02	.02	.02	.02										
5/8					.02	.02	.02	.02	.02	.03	.02	.03	.02	.03								
3/4							.02	.02	.02	.03	.02	.03	.02	.03	.02	.04	.02	.04	.02	.05		
7/8									.02	.03	.02	.03	.02	.04	.02	.05	.02	.05	.02	.06		
1											.02	.03	.02	.04	.02	.05	.02	.05	.02	.06	.02	.08
1 1/4													.02	.05	.03	.05	.03	.06	.03	.06	.03	.09
1 1/2															.03	.06	.03	.07	.03	.08	.03	.10
1 3/4																	.03	.08	.03	.09	.04	.11
2																			.04	.10	.04	.12
2 1/2																					.04	.12

The Use of Expansive Bits.—Where large holes of various diameters are to be bored it is economy to buy an adjustable *expansive bit,* that is, a bit that can be adjusted to bore any size hole from ½ to 1½ inches, the price of which is 60 cents. An expansive bit that will bore holes from ⅞ inch to 3 inches can be bought for 90 cents.

A Patent Nail Holder and Set.—The nail set has a flat steel spring near the small end. When a small nail or a brad is to be driven it is placed between the spring and the set and it is then easy to hold it in the exact position when the first blow of the hammer can be given it and the holder removed. It is a great improvement over holding a small nail between your thumb and finger. It costs 30 cents.

How to Etch Your Name on Steel Tools.—Make a wax by melting together 1 ounce each of beeswax, Burgundy pitch and asphaltum and stir until thoroughly mixed. Warm the knife blade or tool to be etched and apply a layer of wax while it is still hot with a dabber made of a tuft of cotton covered with a bit of soft silk until the wax is spread evenly over the surface.

When the wax is cold take a needle, or the sharp point of a bone stylus, and cut through the wax so that the bright surface of the steel shows through. Mix 1 part of nitric acid with 5 parts of water and apply this solution to the surface, using a camel's-hair brush to make the liquid flow into every line.

Let it remain for 10 minutes, when the acid will

eat into the steel, or *etch* it as it is called. Wash off the acid in hot water and rub off the wax with gasoline or benzine.

HOUSEHOLD HELPS

To Tell the Weight of a Cake of Ice Without Scales.—When you tell the iceman to bring you 100 pounds of ice and it looks like 50 pounds you can very closely approximate the weight of it by this simple rule: Multiply the length of the block by the width and the height and divide the product by 30 and the quotient will be very nearly the weight of the ice. As an example, suppose the block was 20 inches long, 20 inches wide and 7 inches high, the product is 20x20x7 or 2800, and this divided by 30 equals a little over 90, which would be the weight of the ice in pounds.

To Keep a Broom in Good Condition.—When wash day comes boil the broom in soap suds and this will make the straws much stronger but still not stiff enough to cut the carpets.

To Make Sticky Fly Paper.—To 6 ounces of boiling water add 2 ounces each of Venetian turpentine, Canada balsam and castor oil. Stir well and apply the sticky compound while it is hot to a highly-glazed piece of paper by means of a brush. Leave a margin of half an inch around the edges of the paper so that it can be handled.

To Make a Good Household Paste.—A good

paste for general use can be made by simply boiling a little wheat flour and water together and adding a pinch of alum. A few drops of oil of cloves will prevent it from spoiling.

To Tell How Old an Egg Is.—You can tell how old the eggs the grocer sells you are, easier than you can tell how old Ann is, and besides it's more profitable.

Dissolve 2 tablespoonfuls of salt in a teacup of water. Then drop the egg in. If it falls to the bottom of the cup the egg is fresh laid; if it remains suspended between the bottom and the top of the solution it is perhaps four or five days old, and if it floats on top of the water you can depend it is a good, old, ripe egg, fresh from cold-storage.

How to Make Putz Pomade.—The two following formulas are simple but excellent ones for making *putz pomade,* a paste much used for polishing all kinds of metals.

(1) To half a cup of kerosene thoroughly mix an equal amount of powdered *rouge.* Apply the paste with a cloth and polish with a clean cloth or chamois skin.

(2) If the odor of kerosene is objectionable then use this one. To 6 ounces of *iron sub-carbonate* add 2 ounces of powdered rottenstone and mix them well; then add enough lard oil to make a light paste and scent it with rose or other flavoring extract.

To Prevent Lamp Chimneys from Breaking.—The chief reason that lamp chimneys break is due

to their brittleness. To soften or anneal the chimneys place them in a pot filled with very cold water to which you have added a handful of coarse salt. Heat slowly until the water boils and then let the chimneys in the water cool exceedingly slow. The whole process ought to take about three hours. It is a good plan to use a thermometer to be able to know whether the water is heating or cooling too rapidly.

To Take a Glass Stopper Out of a Bottle.—If the stopper is stuck fast in the neck of the bottle

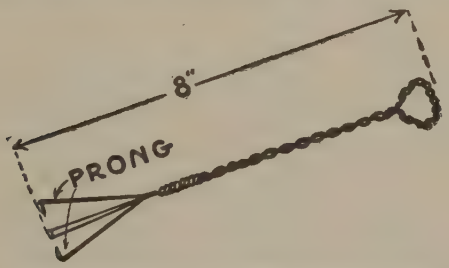


FIG. 75.—A spiritualistic cork extractor.

it can be removed by putting a drop of olive oil between the stopper and the mouth of the bottle and heating the neck with a lighted match, turning it in the flame so that it will be heated equally and expand accordingly, otherwise it will break when the neck is well heated; a twisting motion given to the stopper will generally loosen it.

To Remove a Cork from the Inside of a Bottle.—A cork extractor can be made of heavy iron wire

as shown in Fig. 75. To use it insert it into the bottle and get the cork in the middle of the remover. Then holding the bottle upside down pull the cork to the neck, when the prongs will grip the cork and an extra hard pull will extract it.

How to Fit a Cork. —A cork that is too large can be made to fit a bottle by cutting a deep V-shaped notch across the bottom with a sharp knife.

To Make a Cement for Glass, China-Ware, Etc.—A very good cement for glass and china-ware can be made by dissolving 2 ounces of clear, powdered gum arabic in a little water. Then dissolve $1\frac{1}{2}$ ounces of pulverized starch and $\frac{1}{2}$ an ounce of sugar in the gum arabic solution; stir the mixture well and heat it over a *water bath*—that is, an inner dish separated from the one that sets on the fire and which is filled with water—until the starch becomes clear, and then add a few drops of oil of cloves to keep the cement sweet. When cold it should be a little thicker than cream and it should stay so. This cement is also useful in joining wood, leather, metal, etc.

How to Make a Kitchen Reminder.—It is often difficult to remember all of the staples you need, such as soap, sugar, sal soda, etc., when the grocer boy comes, and this reminder is a great first aid to the memory.

On a piece of cardboard 10 inches on the sides draw a 9-inch circle and draw another circle inside this one which has a diameter of 6 inches. Now di-

vide the circles into 60 equal spaces and, starting at the point which corresponds to 12 o'clock on the face of a clock, print or write in each consecutive space the following words:

Macaroni	Sago	Yeast	Dried
Matches	Salt	Stove	Fruits
Molasses	Sardines	Polish	Crackers
Mustard	Soap	Lard	Coffee
Nuts	Soda	Ketchup	Codfish
Oil	Spices	Jelly	Cocoa
Olives	Starch	Jam	Chocolate
Pickles	Sugar	Honey	Cheese
Lemons	Syrup	Hominy	Capers
Potatoes	Tapioca	Gelatine	Canned
Preserves	Tea	Fruit	Fruits
Prunes	Vegetables	Flour	Candles
Raisins	Vinegar	Farina	Butter
Rice	Wax	Extracts	Borax
Beans	Baking	Eggs	Bluing
	Powder	Soup	Blacking

Next cut out six hands of heavy tin and make each one $3\frac{1}{2}$ inches long and with a $\frac{1}{4}$-inch hole drilled in the large end like the hand of a clock. Get a machine screw $\frac{3}{4}$ inch long and also eight washers, the holes of which are $\frac{1}{4}$ inch in diameter.

Slip a washer over the screw and then put on a hand, then a washer, next a hand, etc., until all of the hands are on and you have only one washer left. Now make a $\frac{1}{4}$-inch hole in the center of the cardboard and slip the screw through it so that the hands are on the same side of the board as the names of the

provisions. Put the last washer on the end of the screw which projects out of the back of the cardboard and screw the nut on tight.

The reminder can then be hung up on the wall and as fast as the groceries in the pantry run out turn a hand to each name, and then when the grocer comes you can give him the order by merely glancing at the reminder.

THE END.

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